The Welding Engineer

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Founded by L. B. Mackenzie, 1916

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DECEMBER, 1931 | VOL. 16, NO. 12

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THE WELDING ENGINEER PUBLISHING CO.

608 S. Dearborn St., Chicago, Ill.

Telephone WEBster 7134

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Published on the 15th of each month. Subscription payable in advance and postage free. United States and possessions, $3 a year; Foreign Countries, $4 a year; Canada, $4 a year; Single copy, domestic, 25 cents; Single copy, foreign, 30 cents. Entered as second-class matter January 20, 1916, at the postoffice at Chicago, Illinois, under the act of March 3, 1879.

Last advertising forms close at 8:00 a. m. on the 12th. To show proof for correction copy must be received at an earlier date and allowances should be made for delay to mails. All copy should be in by the 12th of the month at the latest.

The Welding Engineer does not publish in its news or advertising columns any matter that deals with or refers to either personal or legal controversies.

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EDITORIAL

The 1932 Outlook

LOOKING ahead to the business possibilities of next year it is not sufficient to count expectantly upon external or artificial influences for the stimulation of trade. This has been a costly lesson for many American business men to learn during the past twelve months. Now there are many signs that business executives are prepared individually to contribute something real toward a new and better era. Fundamentally the new thought is in the direction of profit rather than volume. The 1932 idea in business can also be expressed in terms of offering better values, which is a healthier stimulant to buying than mere price cutting. These are conditions which are particularly easy for the relatively small business to meet and this is encouraging because, a total of a great many small payrolls makes a very big payroll, and if there are occasional weak spots developing they do not affect each other as a few weak departments on a big payroll may affect other departments.

Through its inherent flexibility and adaptability to changing conditions the plant of average size is faced with many opportunities to weld for profit in the immediate future. This profit can be augmented by carefully planned economies. Improved procedures, giving better results in the way of additional strength, longer service or better appearance add salability to a product. This increased salability can be expected to reduce the selling cost and is in line with the matter of offering better values which was mentioned above. Changes in design can also have the double effect of reducing the production cost in various ways and at the same time putting more value into the product, itself, from the viewpoint of the customer. Where a plant is using welding equipment or welding materials, which were selected and approved several years ago, the probability is very great that the installation of more up-to-date equipment and the selection of materials better suited to present requirements would prove to be a splendid investment when the final figures are obtained from the cost department. There is also a good possibility of further cost reduction by giving thought to the welding personnel. Wherever there exists any possible doubt about the efficiency of operators, it is not at all a difficult matter to settle this doubt through the medium of qualification tests. It is just as sensible to overhaul the ability of an operator as it is to overhaul a piece of plant equipment and strengthen it in places that are not fit for service. Qualification tests can be used to bring out the weak spots and experience has shown that these weak spots can usually be corrected, and that after they are corrected there is a marked improvement in both the efficiency and the morale of the organization.

The effect of such systematic attention to welding economies (instead of leaving it up to the purchasing agent and employment manager to keep down costs) must be carefully considered in the light of possible reductions in the cost of selling. Manufacturers must realize that better values will attract the dollars in the months to come. The welding department must realize that their continued employment depends upon orders and that any improvement in the efficiency of the department is an aid to getting the orders which keep the wheels turning. It is a period when new methods, new equipment, and new materials should be investigated so that no profit opportunity will be lost in production.

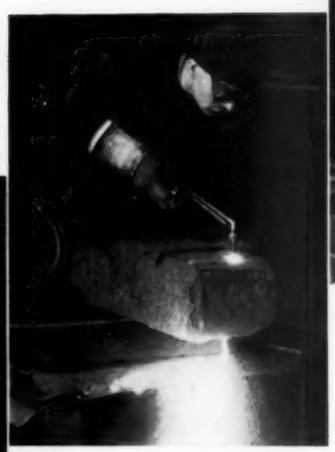
As for the commercial welder, who has been able to carry on through the present period of distress, his outlook is promising. Just as steadily as employment increases, there will be a demand for reconditioning of unserviceable machinery which has not been repaired for the simple reason that there was no use for it. In this line of business, however, there is also going to be a need for readjustment. Shop methods must be studied carefully to avoid wasteful practices and a careful watch must be kept for faulty economies which defeat their own purpose. The reason for this is that even repair welding may be expected to produce a smaller margin of profit in a good many cases. If costs are not kept down at a rate corresponding with some of the products in material costs, a good many old customers may be able to figure that it is cheaper to buy new equipment than to have old equipment repaired. This is not to be construed as indicating that repair work has been priced too high. It is rather a word of caution to the commercial welder to get acquainted with conditions as they actually exist, to face the facts and to adjust his business accordingly. More attention than ever should be given to the possibilities of production jobs. The handling of production jobs develops a study of business methods which is good for the small shop.

It is safe to predict that the welding industry will be the first to feel the beneficial results of improved industrial conditions. As a matter of fact, there are now current some encouraging reports that the industry is already feeling this effect. It is necessary, however, to base operations and policies on general conditions as they exist and to work in the right direction, if any individual or any firm is to get a proportional share of the benefits from a rising curve of industrial activity.

Associations as Business Builders

SPEAKING before a recent meeting of the American Trade Association Executives, F. M. Feiker, director of the Board of Foreign and Domestic Commerce, has indicated that each trade association should act as an essential unit in the general endeavor to stabilize business conditions and restore confidence in business. He states that the challenge to the trade association at the present time is to organize and plan a program in specialized fields for meeting the economic problems of the moment; such a program depending in a very large degree upon the development of a more complete knowledge of markets and a better knowledge and control of costs. The executives of associations which are doing constructive work and accomplishing real results are probably thinking along the same lines. They would only be too glad to see their own associations so organized and so financed as to be able to provide the machinery whereby the membership would be able to reconcile the factors of production and demand with greater accuracy. The big difficulty lies in convincing individual members of the value of such activity. Mr. Feiker, however, lays it down as a principle that every industry must see to it that it is in possession of factual information concerning both the internal and external trends of that industry which are pertinent to it. He visualizes a new type of trade organization which would function fundamentally as an economic planning unit for its industry and trade. Since all industries are now suffering to some extent through the very lack of this type of activity in the past, present conditions are in themselves a strong argument for this type of association work which might serve as insurance against a recurrence of similar conditions in the near future. The metal working industries contain a great many trade associations. Some of them are still carrying on programs based on conditions that existed when the associations were formed. The demand for a change of program should come from the membership of such groups, and should be supported by the membership. Every trade association today should be active in looking ahead and planning ahead to eliminate guess work, mistakes and blunders in the future operations of its members.

The men were used to another torch . . .



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Weld Strength Demonstrated

A 4-Foot by 2½-Foot Arc Welded Tank of ½-Inch Flange Quality Boiler Plate. Not Annealed After Welding. Holds Pressure Up to 2.300 Lbs.

DESIROUS of extending its applications of welding, and having to contend with statutory restrictions and skepticism of government and insurance officials, the firm of Waterous Limited, Brantford, Canada, arranged a test program last April, for the purpose of demonstrating the strength of welded construction for pressure containers. This was carried out as a practical test on a commercial tank produced under ordinary shop conditions.

Construction of Tank

The plate and heads for this tank were taken from standard stock. This was ½ in. thick flange quality plate, 55,000 —65,000 U. T. S. (Shell, Lukens; Heads, Carnegie). The cylinder plate was machined on all four edges, one side only, to an angle of approximately 35°, so that when rolled an angle of not more than 70° was formed. The two heads were also machined, forming a similar angle.

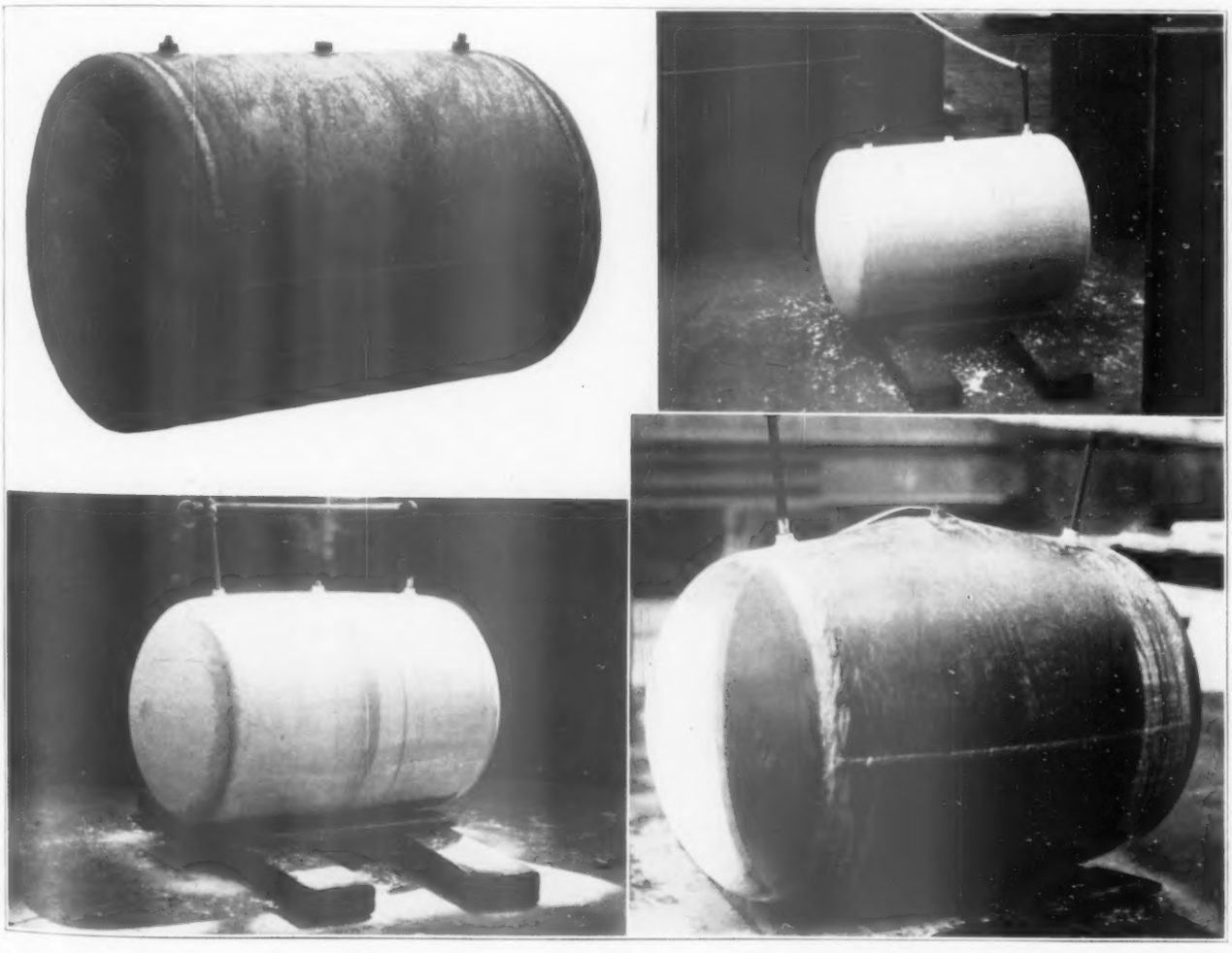
After rolling the cylinder, the longitudinal seam was tacked with an opening of approximately ⅛ in. The tacks, about an inch long, were spaced ten inches apart. Following this the longitudinal seam was completely welded. The two dished flanged heads were now tacked into place and welded with exactly the same procedure as that adopted for the longitudinal seam. Quasi-Arc Uranium electrodes were used throughout, in conjunction with a General Electric multiple operator welding set, and by an operator who was skilled in the correct use of these electrodes. An open single vee butt joint was used for both longitudinal and circumferential seams, the weld being made in three passes, the first with a Size 10 electrode and the next two with a Size 8 electrode.

The three pipe taps, each 1½ in. outside diameter, necessary for the test, were secured as follows: the tap extended inside the shell ¾ in.; around the tap and fitting snugly against the inside of the shell was placed a ring ½ in. thick; this ring was welded to the end of the tap and to the inside of the shell with the Size 8 electrode; a fillet weld between the tap and the outside of the shell was made with a Size 8 electrode.

When completed, the tank was 29¾ in. outside diameter, 47⅝ in. overall length, with a shell length of approximately 36 in.

Method of Testing

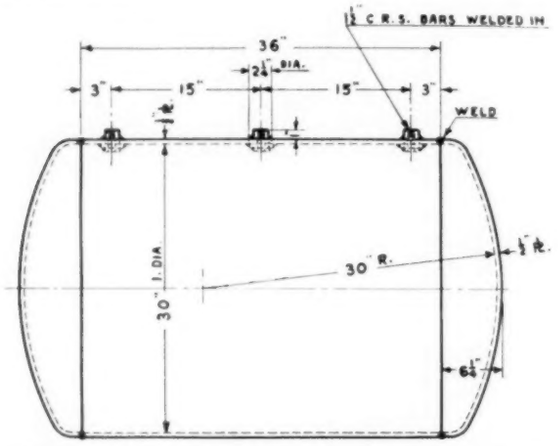
One of the accompanying photographs shows the completed tank and another shows it coated with lime wash and fitted up for the test. The pressure was applied by a plunger sin-



(Above, Left) Welded Tank as Completed. (Right) The Tank Prepared for the Test. (Below, Left) Under 1800 Pounds Pressure the Tank Is Bulging Visibly. (Right) Rupture Occurred at 2300 Pounds and at a Point Well Removed from the Welded Seam.

gle acting pump which gave a pressure fluctuating about 100 lb. each way from the average. This pump was used on account of this property, which produced the effect of a live load rather than a dead load.

The pressure was raised in steps of 100 lbs. each, and held at each successive step for several minutes. Measurements were made while the tank was under pressure up to 1200 lbs. per sq. in. Subsequent measurements were made with the pressure removed, to avoid the risk of accident, as the tank was known to contain a small portion of air which could not be removed.



Principal Dimensions of the Experimental Tank Which Was Made of One-Half Inch Plate.

Whitewash started peeling off the heel of the flanges at 800 lbs. pressure. At 1200 lbs. the length of the tank had increased 1⅝ in. and the diameter at the center had increased 7/64 in. Diagonal lines appeared across the heads at 1300 lbs., and at 1400 lbs. the shell was bulging visibly. The pressure was removed at 1800 lbs. for the purpose of taking a photograph to show the extent of the bulge. The diameters at the ends of the shell had by this time increased about 1.15 per cent, the diameter at the center had increased 3.63 per cent, and the overall length had increased 6.1 per cent.

There was an attempt to assume a spherical shape, and also a distortion of the welding due to the rounding of the heel of the flange and also due to the bulging of the shell. At no time was there any leakage whatever from any weld. Rupture occurred at 2300 lbs., the fracture in the shell plate being about 2½ in. from the center line of the openings. The fracture was about 16¼ in. long and slightly curved. The metal at this point, which is near the reinforcing pad for the center opening, was reduced to 0.4 in. in thickness at the thinnest part of the ruptured edge.

Tensile tests made at the University of Toronto covering four samples of the same material as was used in the tank showed very satisfactory physical properties.

The test was witnessed by:—

Mr. P. W. Lyon, Senior inspector, representing the Dominion Board of Steamship Inspection.

Mr. E. Urquhart, representing Mr. Medcalf, Chief Boiler Inspector, Providence of Ontario.

Mr. G. Service, Hydro Electric Power Commission of Ontario.

Mr. G. E. Mountford, Hydro Electric Power Commission of Ontario.

Mr. S. W. Andrews, Mechanical Engineer, H. G. Acres & Co., Consulting Engineers.

Mr. J. P. Wys, Chief Engineer, Ruths Steam Storage (Canada) Ltd.

Acknowledgment is made to Waterous, Limited and to George J. Foster of the Quasi-Arc Co., Ltd., for their good cooperation in supplying the data and photographs of this interesting test.

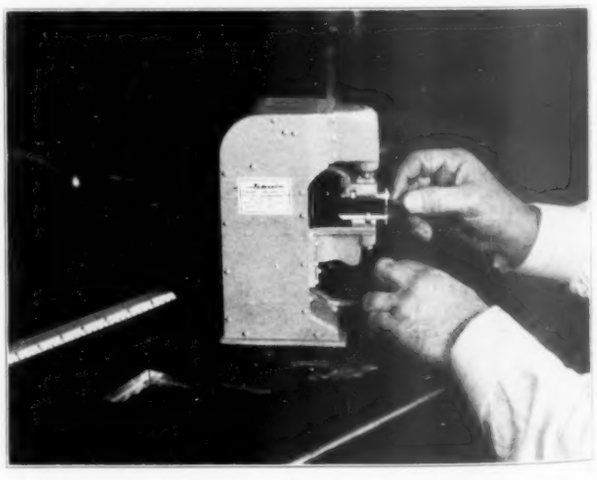
Many Manufacturing Economies Pointed Out in Welding Paper

In their paper, "Modernize by Electric Welding and Heating," presented at the meeting of the Associated Industries of Massachusetts, Boston, October 22, C. L. Ipsen and S. Martin, Jr., of the General Electric Co., pointed out many concrete examples of the economies to be derived from modern arc welded fabrication.

They say, in part, that one large manufacturer, in order to convince himself that welding was less expensive than a corresponding casting, made an actual test case by having welded a special one of his products. The order called for two pieces of apparatus. The over-all dimensions of the cast construction were 21 ft. long x 10 ft. wide and 10 ft. high. Each piece of apparatus consisted of two parts with a total weight of 79,485 lbs.; 54,315 lbs. of which cost 5c per pound and 25,170 lbs. cost 10c per pound. This gives a total cost of $5,232.75. The patterns for this unit cost $2,000. Thus the total cost was $12,465.50 for two units with a total weight of 158,970 lbs. The weights and cost of welded construction are offered for comparison. The two units welded cost $8,762. The weight was 126,000 lbs. Therefore the saving in dollars amounted to $3,703.50, while the saving in weight amounted to 32,970 lbs. This saving amounts to approximately 30% of the cost of the cast job.

Vest Pocket Welder Operates by "Finger" Power

Working with light structural steel and 1/16-in. aluminum welded together with a small torch and aluminum and babbit for castings, Tom Manning and Arthur Williams with the assistance of M. L. Eckman, all of the Federal Machine & Welder Co., Warren, Ohio, have constructed the "vest pocket" spot welder shown in the illustration. In dimensions this midget model of the 3,000 lb. Senior No. 2 is 2 11/16 in. wide, 2¾ in. deep and 8 in. high with a total weight of 12 pounds. The transformer is a small one—1½ in. wide x 2⅜ in. deep and 4½ in. high—which operates from an ordinary 110 volt lighting circuit and draws 1.56 amps. The secondary operating at 2 volts and 58 amperes generates the



Midget Model of Federal Spot Welder.

heat for welding. Throat depth is about 2½ in. and sheet steel ranging between .003 and .010-in. thickness can be welded together with all the reliability of the larger machines.

These two young men in the Federal plant made the model as a pastime, but since its completion, Mr. Eckman reports that it has been very useful for demonstration purposes.

Design of Special Pipe Joints*

Engineering Phases of Welded Piping Installations as Reflected by Recent Developments in Pipe Fittings for Welded Construction

By S. Hirschberg†

THE rapid progress in recent years of the application of fusion welding to piping fabrication and erection has caused the piping engineer to recognize its importance. Fusion welding has become so well established as an engineering tool for the construction of piping, that large manufacturers have developed and put on the market a variety of pipe fittings specially designed for welding. Pipe fabricators are today equipped with machinery and maintain trained personnel for the production of welded pressure vessels and built-up piping constructions.

It is the purpose of the author to give a brief outline of pipe joints, welding fittings and welded headers to summarize the trend. Special attention is paid to the evolution of the flanged pipe joint to indicate the application of fusion welding.

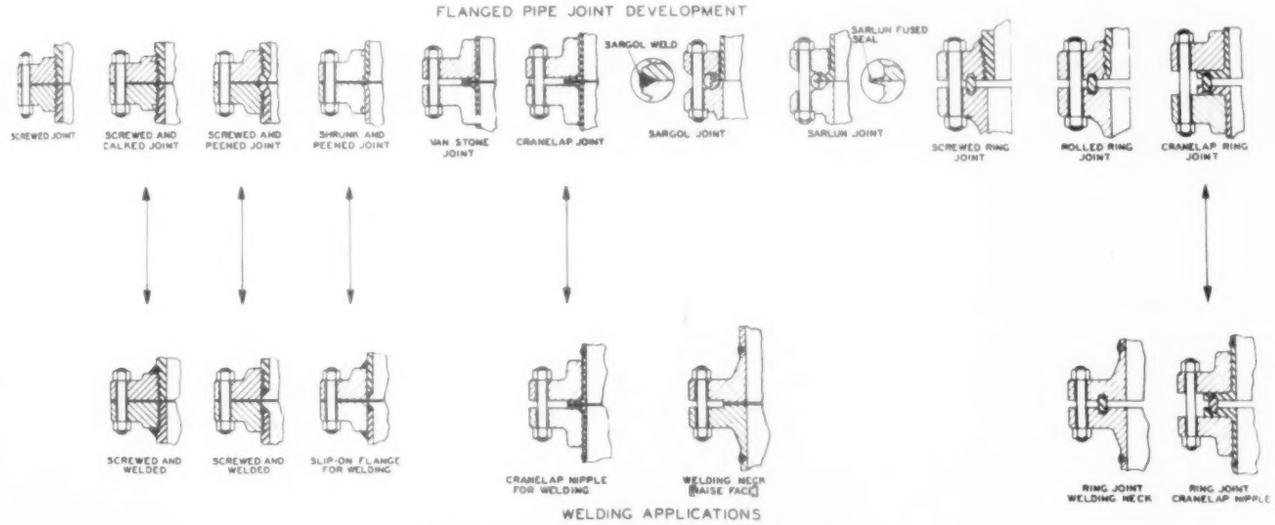


Figure 1. Evolution of Flange Pipe Joints.

Pipe Joints

The demand for fuel economy and higher plant efficiency has caused the power plant designer to increase pressures and temperatures. Commercial steam pressures have increased from approximately 35 pounds per square inch when Crane Co. was founded in 1855 to 1400 pounds at the present. The use of superheated steam became commercially successful about 1898 and since that time the temperature has increased up to 750 degrees Fahrenheit which is the total temperature of the higher pressure stations operating today. Experimental work is being conducted at Purdue University with steam at 3500 pounds; while Detroit Edison Co. are pioneering in steam temperatures as high as 1100 degrees Fahrenheit.

There has been a more rapid increase in pressures and temperatures in oil refineries and cracking plants. It was only about fifteen years ago that oil processes required pressures slightly above atmospheric pressures and temperatures up to 550 degrees Fahrenheit. The extreme pressures in popular practice today in the oil cracking plant approximate 1500 pounds with attendant temperatures of 1000 degrees Fahrenheit. Serious consideration is being given at present of using 3500 pounds per square inch at 900 to 1000 degrees Fahrenheit to obtain greater yield from crude oil by the hydrogenation processes.

Figure 1 illustrates the changes in pipe joint design, to meet the growing hazardous conditions and the application of fusion welding to obtain the advantages of established practices.

The screwed joint is considered safe and reliable for low steam pressures and temperatures and can be used for cold services in the higher pressure range. As pressures and temperatures increased, manufacturers were called upon to furnish pipe joints that would insure a higher all around factor of safety than was previously possible with the screwed joint. Several novel methods were devised to guard against leakage through the threads in an effort to make good the screwed joint. A calking recess was cut in the hub of the flange, which recess was firmly filled with soft copper or other suitable metal. This did not solve the problem as oxidation could take place at the threads. Another method evolved, which was accomplished by rolling or peening the end of the pipe into a peening recess at the face of the flange.

Later the shrunk and peened joint became popular because of the elimination of threads in making this kind of joint.

The lapped pipe joint, commonly known as the Van Stone appealed to power plant engineers. In this type of connection, the joint is made on the lapped over pipe. The square-cornered Cranelap joint was introduced in 1911 and was an improvement over the Van Stone in that it eliminated the rounded corner on the inside diameter, which formed a lodging place for condensate and sediment causing corrosion to set in.

Metallic or asbestos gaskets are regularly furnished with the screwed, shrunk, and Cranelap joints although the Crane-

*Read before the Thirty-second Annual Convention—International Acetylene Association, Chicago, Illinois—November 11-12-13, 1931.
†Crane Co., Chicago.

lap faces can be machined smooth and finished for making up a metal-to-metal joint. Furthermore, these joints can be machined to incorporate the standard facings, namely, the tongue and groove, the male and female, or the raise face.

The Sargol Joint is a weld-sealed joint without an interposed gasket and has been used in many steam plants. A welding rod is used to guard against leakage through the contact faces. The Sarlun Joint was patented in 1930 and is a metal-to-metal joint having long thin lips on the outer periphery of the contact faces requiring the application of a welding torch only, to seal the joint. The Sarlun joint has been installed and operating successfully in nearly all the 1400 pound stations.

The ring joint has been gaining favor in the oil industry due to its ability to withstand extreme pressures and temperatures and its ease to assemble and take apart, which is an important factor because of coking of the lines. Today it is possible to make a sufficiently heavy Cranelap to permit machining of the ring joint grooves. Previously, it was necessary to resort to the screwed or rolled joint with the grooves for the ring cut in the flange. The tubing, in the case of the rolled ring joint, is extruded into the grooves of the flange by means of a boiler tube expander making it a laborious operation.

Fusion welding can be applied to the flanged pipe joint as illustrated. Piping engineers are rapidly adopting these various welded constructions. The shipbuilding industry is specifying the screwed and welded, and the Cranelap nipple applications in main steam piping connections. While the natural gas and oil transportation industries are making use of the slip-on flange and Cranelap nipple for valve and header joints. The heating industry seems to favor the welding neck type. Piping installations in power plants and oil refineries indicate that no particular preference is shown. Some engineers desire the welding neck flange, while others favor the slip-on flange or Cranelap nipple. The Cranelap affords a loose flange that can be swiveled in any position for bolting while the welding neck or slip-on type flanges must be carefully aligned before tack welding in place.

All these flange combinations are carried in stock ready for welding. Welding neck flanges are made of forgings in four series, namely for 150, 300, 400 and 600 pounds of steam pressure or equivalent hydraulic ratings. The Cranelap nipples in standard and extra strong thicknesses are regularly carried in stock 12 inches long for pipe diameters one inch to 12 inches and can be supplied with forged steel flanges. The screwed flange, as is, or bored out for the slip-on welding application is also a stock item.

It may be interesting to mention at this time, that a good many inquiries have come to the author's attention, in which

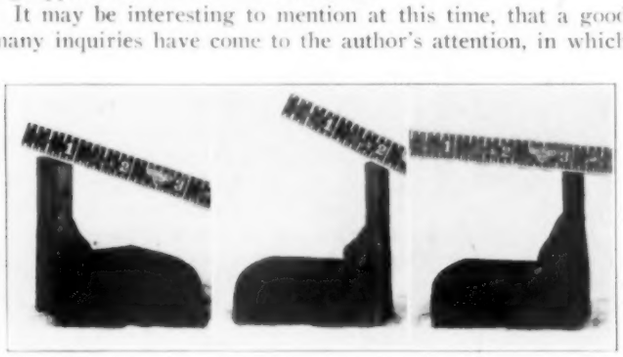


Figure 2. Effect of Welding Methods on Welded Flange Joints.

engineers have requested special machining of flanges to provide for welding grooves. From Figure 2 it can be readily concluded that no machining is necessary. These flanges were welded by an experienced welder using the oxy-acetylene method. The flange on the left was machined to a straight chamfered groove. Note that the weld did not take in the groove, the fusion taking place at the top of the flange. Some engineers felt that a round bottomed groove would be the solution. The flange in the center indicates clearly that the rounded groove is detrimental rather than an aid, for the fusion took place on a narrow portion of the flange hub. The flange on the right represents a regular flange with only the surface removed: the fusion to the pipe and flange presents the best condition. This principle similarly applies to the slip-on flange application.

The open type butt weld joint is being used extensively in long lines for the transportation of natural gas and oil, ex-

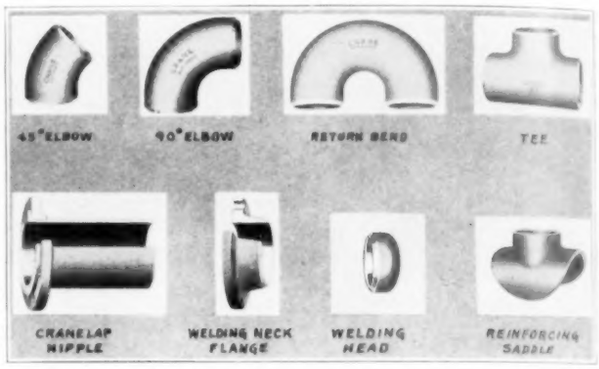


Figure 3. Stock Welding Fittings.

treme pressures approximating 800 pounds. Numerous heating installations have recently been built using butt weld joints. Steam power plants with pressures as high as 450 pounds have been in operation for some time, indicating excellent results with butt welded joints. In the author's opinion the welded joint will gain wider application and acceptance for higher pressure and temperature services if the joint is so designed that the weld is only subjected to simple stresses. In concluding the subject of pipe joints, the author suggests that the welding industry encourage and assist with research work to make available more information in regard to the proper design of welded joint to meet the many different conditions of services to which piping is subjected to.

Welded Fittings

A large assortment of fittings are on the market today which have been specially designed for welding. The steel from which these fittings are forged has approximately the same physical and chemical properties as open hearth steel pipe, thus assuring ease of welding and uniform distribution of expansion and contraction stresses. In Figure 3 are shown the various welding fittings as manufactured by Crane Company.

These welding bends and ready-made tees do away with the welder's difficulty of making built-up constructions involving template layout and cutting preparatory to welding. Moreover poor welds are likely to result because of the amount of care and increased skill required to make these enveloped curved welds. Only simple straight circumferential welds are necessary when using welding fittings which a welder with little experience can accomplish satisfactorily.

One of the major objections to the built-up mitre bend or branch connection is that there is no opportunity for testing the strength or tightness of the more difficult welds required for these constructions until the completed line is ready for service. Each forged tee or seamless elbow, before being placed in stock, is given a hydrostatic test in accordance with standard test specifications for the particular service.

The seamless elbows and return bends, and the forged tees are made to standard and extra strong iron pipe dimensions.

Design of Elbows and Tees

When designing any pipe fitting, whether it be an elbow, tee or valve, careful thought must be given to three factors, namely, strength, compactness and pressure drop due to friction. These considerations will be briefly discussed.

Seamless welding elbows and forged tees are made with lighter wall thicknesses than cast iron fittings for the same service. The reason can be best explained by inspection of the relative inherent advantages of the forged steel used in the welding fittings and the cast iron or semi-steel used in cast fittings.

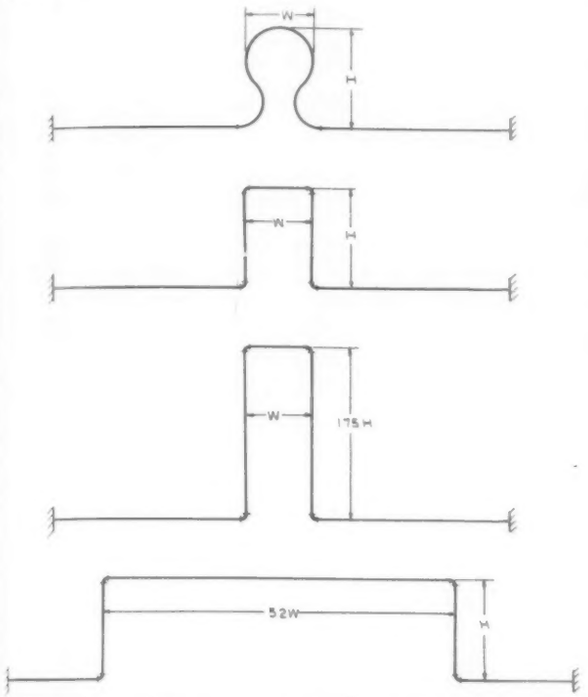


Figure 4. Proportions of Square Expansion Bends Required to Accomplish Flexibility of Conventional Design Shown at Top.

The average physical characteristics of the two materials are as follows:

	Forged Steel	Cast Iron or Semi-Steel
Tensile Strength, Lb. per Sq. In	55,000-65,000	24,000-32,000
Yield Point, Lb., per Sq. In.	30,000-40,000	
Fatigue Limit		12,000-15,000
Modulus of Elasticity	30,000,000	13,000,000

The radius of curvature of elbows, no doubt, determines the compactness and affects the pressure drop due to friction. If we choose a large radius of curvature in designing a 90 degree elbow, we sacrifice compactness. Besides theoretical assumptions and laboratory experiments, many factors other than the radius of curvature affects the pressure drop in a particular piping installation. Condition of the inside surface of the pipe after being in service for some time, changes in direction of pipe lines, the initial velocity and pressure, the kind of fluid, etc., will influence the ultimate cost of delivery of the fluid to its objective through the piping. Experimental data now available with respect to pressure drop on complete piping installations is much too meager to permit a final conclusion of the correct radius of curvature.

The keynote of the success of fusion welding in the piping industry has been compactness and lighter weight. To be in keeping with this general trend, seamless welding elbows are manufactured to relatively short radii. Seamless elbows are, however, bent to a convenient radius to allow ease of welding. The use of the short radius affords the welder a stock fitting which can be installed anywhere, regardless of cramped quarters. Where nesting of many pipes together is imperative, as in large heating installations, the question of space is important.

The ready-made tees are made slightly heavier than the pipe to increase their strength and have easy sweep outlets to accomplish desirable flow conditions.

As an added feature the tees, elbows and return bends are provided with ample tangents at the ends to permit ease of lining up the elbows by the use of ordinary jigs preparatory to welding. Seamless elbows for welding are made in a large variety of metals other than steel and can be furnished upon application.

Expansion Bends and Relative Flexibility of Elbows

The method of providing for expansion and contraction due to temperature, when designing a welded piping installation is no different than that of a flanged or screwed joint installation. The same type of conventional design of expansion bends which have been established for years can be furnished with ends beveled for welding. Expansion bends can be built up by the use of seamless elbows welded to lengths of straight pipe forming a loop. But great care and thought should be exercised to provide adequate flexibility without inducing extreme stresses in the pipe wall when using this built-up expansion bend.

In addition to efficiency and economy in a modern steam piping system with its intricate and complex layout, we must consider the reliability of the equipment installed upon which depends the continuous successful operation. The stresses and flexibility in the line determine the reliability or life of the system.

The primary purpose of an expansion bend is to compensate for the elongation or contraction of the pipe line due to temperature changes. The amount of expansion to be provided can be determined when the temperature difference between extreme hot and cold conditions, the length of pipe, and the coefficient of expansion of the material are known. The next step is to select a pipe bend or bends affording sufficient deflection or spring to take care of the expansion of the line. The most desirable pipe bend is one that will deflect the maximum amount without inducing extreme fibre stresses in the pipe material or excessive forces tending to tear the piping loose from its anchors. There are well established formulae derived by intensive research and study which lead to the solution of deflection and stresses in expansion bends of all shapes.

The single line drawings of pipe bends shown in Figure 4

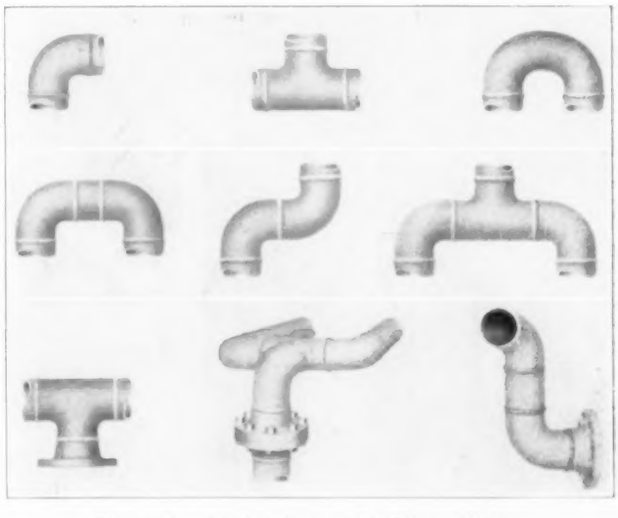


Figure 5. Applications of Welding Fittings.

will be helpful in comparing the flexibility of the "square bend" made of seamless elbows and straight pipe with the conventional expansion loop, commonly known as the double offset expansion U-bend. The proportions shown are for a random case, but are representative of what may happen. The results obtained indicate that a "square bend" made of seamless elbows will deflect much less than the conventional design shown at the top of Figuer 4, when the two types are made to the same height and width, assuming the same stress or factor of safety in the pipe wall. To obtain the

same amount of deflection in the "square bend" for the same amount of stress as in the conventional design, it is necessary to increase the proportions as shown in either of the lower two diagrams of Figure 4. In actual practice the space available will rarely permit this expedient. Furthermore, when space permits, the use of a larger conventional expansion bend offers even greater deflection.

The shop fabricated conventional expansion loop similar to that shown in Figure 4 is not only more economical of space for equal stress and flexibility, but also requires fewer joints.

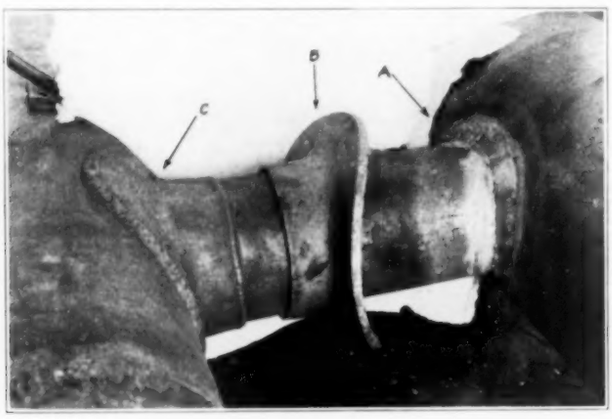


Figure 8. Method of Welding Reinforcing Saddle.
First Weld Is Between Branch and Header (A). Saddle (B) Is Then Positioned and Welded in Place (C).

The "square bend" made of seamless elbows has necessarily eight welded joints, while the conventional design has but two. The writer firmly believes that the seamless welding elbow should be used as a fitting and not as an integral part of an expansion pipe bend, unless in extraordinary cases. Figure 5 represents a few of the applications of welding fittings now on the market.

Valves

The subject of valves, being prepared with ends beveled for welding to eliminate flanges or screwed ends, has been much discussed by proponents of welding. It may be encouraging to know that development work is now under way to build valves more suitable for welding. Following are some of the facts to consider. Valve seats must be machined to extreme close tolerances to secure absolute tightness when the valve is closed against pressure. Any distortion created by the intensive heat of welding operation may cause leakage. If the ends of large valves are beveled for welding, it would be extremely difficult to make shop tests for seat tightness and body strength, which are required by codes and specifications. The flanged or screwed end valve is conveniently tested by either bolting of a blind flange or a threaded plug. Finally, a valve is a mechanism consisting of moving parts operated at frequent intervals for controlling flow, and therefore, ease of removal from the line is an important factor.

Welded Headers and Shop Fabrication

A header is a pressure vessel with many outlets, thereby constituting a complicated shape. Figure 6 represents a test assembly of a 24-inch welded header with gusset plate reinforcements. Intensive testing revealed that the maximum concentration of stress occurs at the crotch where the outlets or nozzles join the main cylinder. The gusset plates, although reinforcing the immediate area, shifts the place of maximum stress concentration due to its rigidity, but the gusset plate reinforcement does not eliminate the weak sections.

The ideal header design is one that is balanced, producing uniform stress distribution throughout the entire header when subjected to actual working conditions. To approach this ideal special reinforcing saddles have been developed for field or shop use. Figure 7 shows the completed header with reinforcing saddles in contrast with the gusset type reinforced header.

Figure 8 is a close-up to illustrate the method of attaching this excellent reinforcement. Note that the outlet is welded to the main cylinder to provide a pressure-tight joint. The saddle is slipped down to snugly fit around the outlet and the main cylinder. The apron of the saddle is welded to the header, while the neck is welded to the outlet.

In addition elliptical heads of a special design to give maximum strength can be furnished as a regular stock item.

Conclusion

Let us review the activity in various regulatory and standardization groups relating to piping in order to sense the pulse of the public attitude toward fusion welding and to visualize its future scope and possibilities. New revisions of the A. S. M. E. Boiler Code, allowing the use of fusion welding in the construction of pressure vessels and power boilers was adopted by the Boiler Code Committee on June 27, and approved by the Executive Committee on July 7 of this year. Tentative specifications for fusion welding have been drafted by the sectional committee on a Code for Pressure Piping operating under the American Standards Association. Incidentally, it may be appropriate to mention that the latter organization is a "clearing house" for all industrial standardization in this country. The Power Piping Society

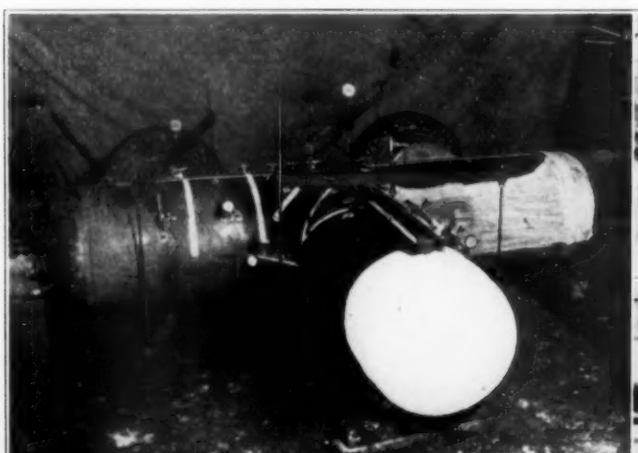


Figure 6. Twenty-Four Inch Welded Header Under Test to Determine Value of Gusset Plate Reinforcement.

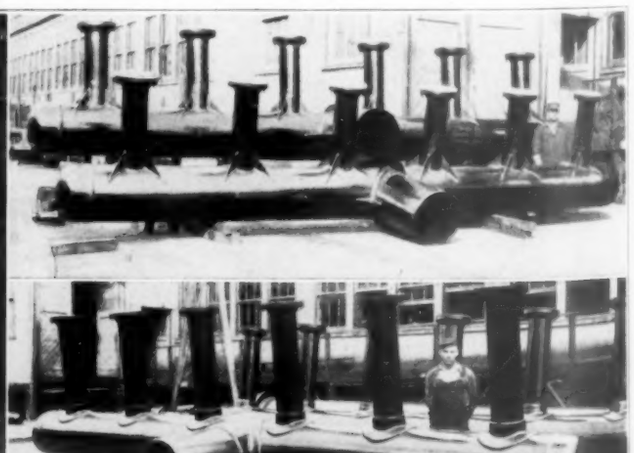
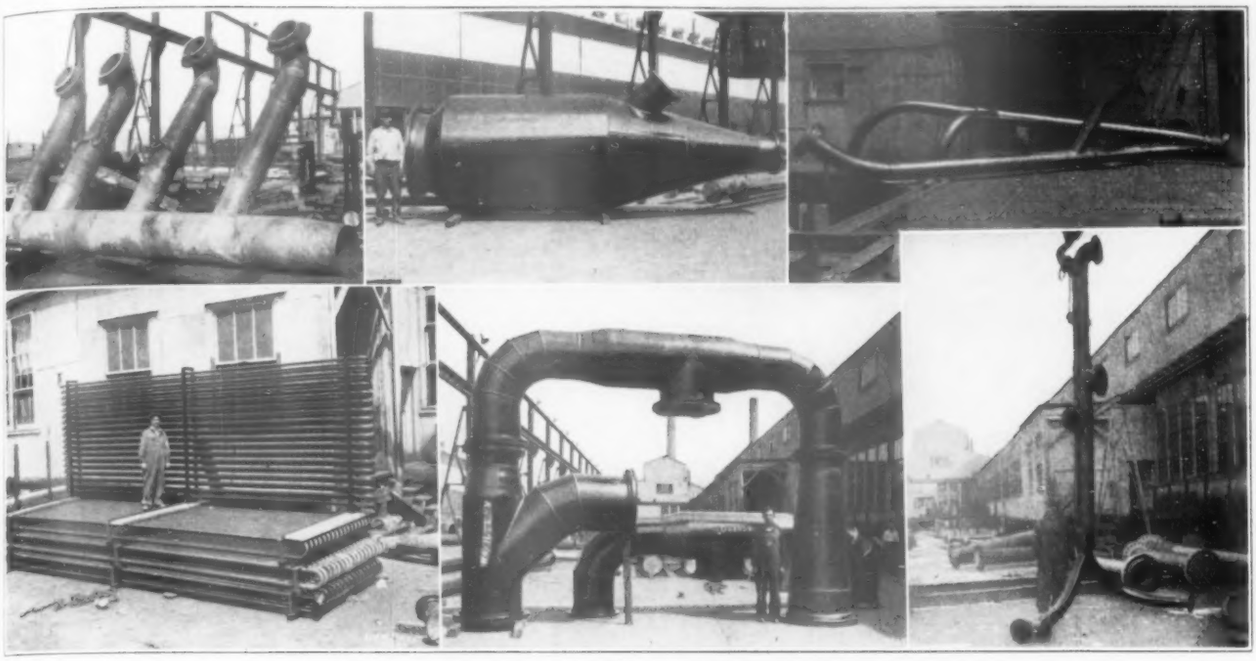


Figure 7. Completed Headers Illustrating Gusset Type (Above) and New Saddle Type Reinforcement (Below).



Typical Assemblies Welded From Pipe and Steel Plate.

(Above, Left) Twenty-Four Inch Header with Sixteen Inch Outlets. Ends of Header Are Swedged Down to Sixteen Inches. **(Center)** Seventy-Two Inch Natural and Manufactured Gas Mixer. Wall Thickness One-Half Inch. Outlets are Twenty-Four and Forty-Eight Inches. **(Right)** Turbine Connection with One and One-Half Inch Wall Thickness for 1500 Pound Steam Power Plant. Connections are Ten by Twelve Inches. **(Below, Left)** Three Inch by Two Inch Condenser Coil. **(Center)** Thirty by Twenty-Four Inch Header. **(Right)** This Sixteen Inch Header Presents a Rather Unusual Shape.

has been making investigations of fusion welding problems as related to piping. This is an organization whose general purpose is to establish standard practices and to cooperate in considering piping problems of general interest to power plant engineers, fabricators and erectors. It is also important to note that the Welding Committee of the Heating and Piping Contractors National Association, under the chairmanship of Mr. John Zink, have recently published a "Standard Manual on Pipe Welding." This volume covers the field of pipe welding in a comprehensive manner and should prove valuable in increasing the pace of acceptance of fusion welding in other industries as well as heating.

Welded pipe installations should be carefully designed to take full advantage of welded fittings and shop fabrication where complicated shapes are concerned to insure maximum economy and longer life.

Increase Generator Voltage with Length of Welding Leads

By W. A. Maddox†

Many times it is not convenient to move the welding generator to the job. The welding set may be a permanent installation or the pathway may be blocked. In one case, a shop arrangement made it desirable to use two outlets 250 feet from the 1,000 amp. set that was on a concrete foundation and located near the major portion of the load. The only thing to do under such circumstances is to lengthen the welding leads. In the case of the 1,000 amp. set the outlets were to be used regularly. They were placed near the work and short leads used.

When the leads are lengthened, the operator finds that the machine seems to be weaker. Since most operators are not trained electricians, they cannot understand what has happened. More resistance has been placed in the circuit. The solution of the trouble is to increase the supplied voltage.

For the single operator machines we find by increasing the generated voltage slightly the trouble is eliminated. Let us take a definite case and work out what happens. Suppose the long leads are to be 200 feet. Then 200 feet out plus 200 feet ground return is 400 feet. Assume a welding current of 180 amperes if the leads are of No. 2 B & S, the size often used, which has a resistance of .000156 ohms per foot at 20° C. Then we have .000156 × 400 = .0624 ohms as the total resistance; .0624 ohms times 180 amperes = 11 volts drop, but the nominal arc drop is 20 volts. Hence the generator must supply 31 volts instead of 20, when welding.

For multiple operator, that is constant potential machines, one of two solutions offers itself. The generated voltage might be increased by use of the field rheostat, or additional switches on the resistor panel may be closed. Increasing the generated voltage is not recommended except under very unusual circumstances. It is less efficient and is hard on the generator. Besides any other operator on the same generator using different length leads will be forced to pull a switch on his panel.

Where the Machine Cannot Be Taken to the Work, Longer Leads Solve the Problem.

†*Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa.*

Suppose an operator is using 180 amperes and short leads. He wishes to hook on his long leads of 200 feet, 300 feet, or even of greater length. He simply pushes in additional switches so that apparently he should draw 190 or 200 amperes. He will find by a little "cut and trying" just how much additional resistance he must use.

To be perfectly accurate, as he closes more switches he is really reducing the circuit resistance. The reverse terminology is usually used to the confusion of the uninitiated.

The purpose of the resistor panel is to take the drop from the generated potential of 60 volts down to the arc drop of approximately 20 volts. It also acts as a ballast or stabilizer causing the arc to be maintained better and easier.

If the frame of a building is to be used as the ground return, trouble may be encountered due to high resistance of some riveted joints. This resistance is caused by scale, which forms when the heated rivet cools, and the usual rust on structural steel. It is especially troublesome in welding because of the low voltages and high currents used. To eliminate this trouble, put a short weld on each joint, one inch of one-quarter inch weld will be sufficient.

All-Welded Locomotives Made for Bush Terminal

SEVEN all-welded locomotives have been constructed by the General Electric Company for switching service at Bush Terminal, New York City. While the engines and electric equipment follow the usual standards of design, many new features are incorporated in the framework because of the use of welding.

The complete structure of cab, under-frame and trucks is fabricated entirely from structural steel shapes and plates, and is arc welded throughout. There are no rivets, and bolts have been used only for those portions requiring occasional removal or renewal.

Each locomotive is of the 60-ton type and has a Diesel-electric power plant, using a 300 horsepower Ingersoll Rand Engine. The truck frame consists essentially of three members: two side frames of 26-inch, 151-pound girder beams with a 22-inch, 108-pound girder beam serving as the bolster. The bolster beam is welded directly to the side members, the joint surfaces being reinforced with heavy gusset plates and brace plates. All welds are continuous and, except at a few minor points, all welds on the truck were made with G.E. type R heavily-coated electrode. Load is carried to the journal boxes through double equalizer bars located on either side of the girder beam web. Load is transmitted to each bar through four helical springs. The platform or under-frame has two 14-inch

Sixty Ton Diesel-Electric Welded Locomotive.

100-pound "H" columns for center sills with intermediate and side sills of 6-inch channel. The engine is mounted directly on these center sills so that, in addition to taking the buffing stresses, they afford also a rigid support for the power plant. For the end sills 1½-inch plates are used. A ⅜-inch deck plate extends over the entire platform and is attached to the longitudinal sills by ⅜-inch intermittent welds on a 10-inch pitch. End plates are attached by ¾-inch continuous welds. Body bolsters are attached to all four sills by ¼-inch continuous welds.

The cab structure consists of a framing made of 2-inch Tee sections with continuous welding at all joints. The side and roof sheets are attached to this structure by intermittent welds on a 6-inch pitch, except at the outer surface of the side sheets where, in order to provide water-tight joints, continuous welds are employed. The side sheets are placed inside the framing. This permits tying the edge of the sheet at two places: the intermittent weld on the inside and the continuous weld on the outside. In addition, the backs of the Tee section, projecting through in this manner produce a

(Above) All Welded Truck with Motors Installed. (Below) All Welded Underframe of Steel Plates and Structural Beams.

paneling effect in the cab wall and break up what would otherwise be a monotonously plain surface.

Instead of the usual box cab which has heretofore characterized most Diesel-electric locomotives, a modified steeple or hood type cab is used. The engine and a small portion of the electric generator are enclosed by the long hood, with the remainder of the generator projecting into the main cab. The control equipment, the air compressor and the fuel tank are located under the short hood at the other end.

Resistance Welded Metal Fabric*

Increasing Demands for Heavier Fabrics Has Resulted in Development of Larger Capacity Machines—Welders for Special Materials

By W. T. Ober†

NO DOUBT, you are familiar with metal fabric such as window screening, sand screens, coal screens, fencing, concrete reinforcements for buildings, or concrete road reinforcements. This paper will deal only with those types of fabric made up from a number of individual steel rods or wires where the mesh is square or rectangular in shape and is made by welding each wire or rod to each wire or rod that it crosses at the points where they cross.

Before the advent of welded fabric, the process used was a form of weaving. About the largest size of wire used in any woven fabric was No. 4 gauge. Somewhat over thirty years ago, one Mr. J. C. Perry patented equipment for the resistance welding of metal fabric and the first machine manufactured under his patents was built by the Clinton Wire Cloth Co. at Clinton, Mass. This first machine was made for wire fencing and light reinforcing, and was suitable for fabric of fairly narrow width only. As is usual with first machines, it was not a complete success, but gave promise of providing a means for turning out welded fabric. Within the next few years, a goodly number of similar machines with corrections and improvements were designed and manufactured by the Clinton Wire Cloth Co.—these later machines being capable of handling larger diameter wire and much wider fabric. It is our understanding that a machine to weld 100" wide fabric was the largest manufactured by them and that this machine was capable of welding fabric suitable for light road reinforcement. This machine, Fig. 1, is of the so-called automatic type where all of the longitudinal wires are taken from reels, threaded into the machine—these wires passing up through straightening and tension rolls, passing by

Figure 1.

the welding electrodes in a vertical plane and thence up over take-up wheels or drum, and then to wind-up roll, which coils the completed fabric. It is not, of course, necessary to coil the fabric as the fabric leaves the machine in a flat sheet and may be taken off as such or coiled at the user's will. The transverse wires are taken from reels, fed through straightening rolls, cut to length, received by fingers which at the proper instant in the cycle of the machine, places these transverse wires into position in the welding electrodes; then the welding electrodes move forward and all of the welds between transverse wire and all longitudinal wires are made at one time after which the take-up wheel or drum automatically moves the fabric along to the next determined position for receiving a transverse wire.

Each weld is made by an individual transformer of proper rating depending upon the size of the wire to be welded. Each pair of welding electrodes, while controlled from a common drive exerts pressure at the point of the weld, inde-

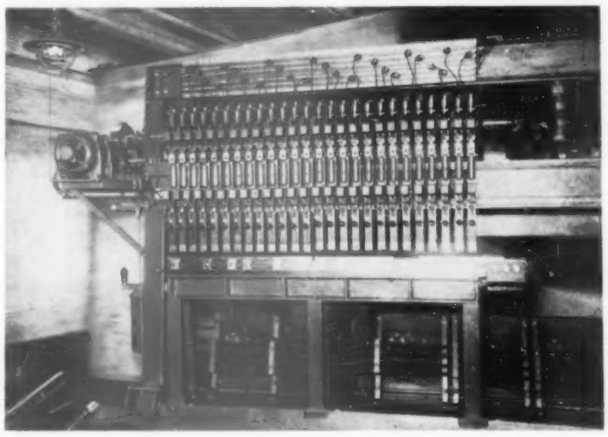


Figure 2.

pendently of any other pair of electrodes by means of an adjustable spring so that in wire welding units, so arranged and operated that they make all welds simultaneously, the work being at a standstill while welding is being done. Each welding unit has its own circuit making and breaking switch adjustable to provide for setting so that welding current is not turned on until a predetermined pressure has been exerted on the work and to shut off the welding current after a predetermined movement of one electrode has sunk into the other wire a predetermined amount.

As the use of concrete road reinforcement increased and wider roads came into use, also, the loads which these roads had to carry became greater, the demand for wider sheets of fabric made from heavier rods or wires also increased. Then, too, the demand for larger sheets of heavier fabric for building construction and general reinforcement purposes increased. At first, it was felt that the automatic type of welder could not be used for making this heavier and wider fabric because of the stiffness of the rods or wires used and the great power and bulk of parts which would be required for the automatic feeding, straightening, cutting and reeling of these heavier wires. During that period there were a number of machines of the semi-automatic type developed and built by manufacturers of welding equipment, and also manufacturers of reinforcement fabric. This particular type, Fig. 2, was designed to make a six-foot width of fabric where the maximum size of both longitudinal and transverse rods was ⅜ in. in diameter. The machine was equipped with twenty-six (26) welding heads or units, all operated from a common driven drum carrying a series of cams for actuating the welding heads. Only one welding transformer was employed —this transformer being rated at approximately 75 kva and all the welds were not made simultaneously but rather in rapid rotation. The drum carrying the cams for operating

*Paper presented at the Fall Meeting, American Welding Society, Boston, September, 1931.

†Asst. Sales Manager, Thomson Gibb Electric Welding Co.

the heads rotated at a speed of approximately 12 r.p.m. or, in other words, when using the total twenty-six (26) welding heads with which the machine was equipped, all twenty-six (26) welds were made in approximately five seconds. There was provided on the machine storage space for welding heads or units not in use on the particular mesh being welded. This was to provide for making mesh employing various numbers of longitudinal wires so as to obtain different spacing of these wires. The narrowest spacing of longitudinal wires provided for was 2 in. All of the longitudinal and transverse wires

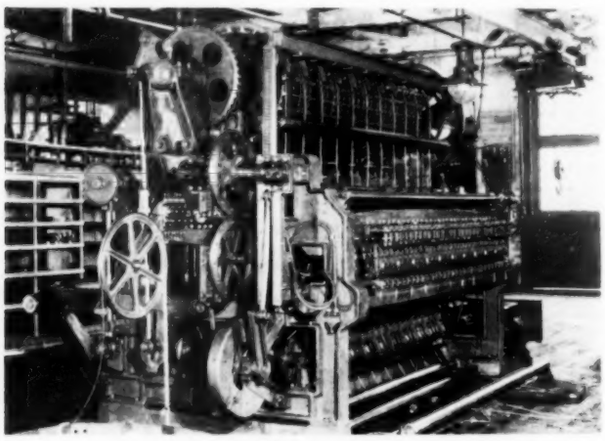


Figure 3.

were straightened and cut to length before coming to the machine. Suitable jigs and carriage were used into which the wires were loaded and then this jig and carriage moved manually through the throat of the machine to bring it into position for the welding of each successive transverse wire to longitudinal wire. The fabric thus obtained was in the form of a flat sheet.

During the next few years there was considerable interest in this flat type of fabric and numerous concerns were interested in welding fabric made from rods—the material being re-rolled railroad rails. This material, being hot rolled, having a fairly heavy coating of scale and containing a rather large amount of carbon, presented somewhat different welding problem than the fabric made from clean wire or rod of low carbon content. It is, of course, a well recognized fact that any appreciable coating of scale or rust is an insulator and interferes with the passage of low voltage, high amperage welding current. Because of the relatively high surface resistance between the two pieces of work to be joined caused by this insulating scale, somewhat heavier pressure must be exerted on the work in order to assist in preventing the burning of the material at the highly localized points of initial contact. Also, in the case of this high carbon content material, if the weld is made very quickly, say in a fraction of a second, very little material outside of the weld zone becomes heated to any degree, and therefore, the welding joint will cool rapidly in the air, resulting in brittleness. It is obvious that if a low enough open circuit secondary or welding voltage across the electrodes is used so that in the case of clean wire, the welding time would be several seconds, this welding voltage will not be sufficient to break through the coating of scale in many cases, and if it does, there is also danger of burning the material at the weld and of one wire sinking into the other to too great a depth, thus destroying the strength of the joint. It has been accepted by most manufacturers of welded fabric that the total added thickness of the two wires at the completion of the weld should not be less than *approximately two-thirds* the total thickness of the two unwelded wires if maximum strength is to be obtained. The above refers, of course, to round wires or rods.

One scheme which has been employed successfully in the welding of this scaly high carbon content rod is to employ what we term bridge-type electrodes; that is the electrodes do not contact with the wire directly over the point of weld, but rather to two points on each wire, approximately one to one and one-half diameters away from the center line of weld. In this way, not only is the material at the weld heated, but also, the material for some distance either side of the weld, thus insuring sufficient heat remaining in the weld for a long enough period of time to obtain a partial anneal. Fabric welded in this manner has withstood successfully the usual tests to which such fabric is submitted. Because of the extreme stiffness of these rods made from re-rolled rails and the coating of scale, they have not, as yet, been successfully welded on the automatic type of equipment employing the automatic feeding from reels, straightening, and cutting-off devices.

Figure 3 shows a recent, full-automatic fabric welder, designed to accommodate fabric 102 in. in width, or 100 in. between the center line of outside longitudinal wires with provision for a 1 in. overhang on each side of each transverse wire, all wires being clean and of low carbon content.

This particular machine is equipped with thirty-one (31) welding transformers and welding units, thus making it suitable for accommodating maximum of thirty-one (31) longitudinal wires, minimum spacing of which is 2 in. These spacings may be increased in steps of ½ in. by adjustment provided for each welding unit and transformer. When the width of mesh becomes any even multiple of 2 in., it is, of course, only necessary to break the primary circuit of the intermediate welding transformers and remove the welding electrodes from the same units, in order to make these intermediate units inoperative and thus obtain the desired spacing.

The minimum spacing of transverse wires is 2 in. and this spacing may be varied in steps of 1 in. up to 16 in. with the exception of 13 in. and 15 in., which are not obtainable because of the design of the double pawl and ratchet, and ratchet wheel used for rotating the take-up wheel or drum. These spacings of 13 in. or 15 in. are ones, however, which to date, have never been encountered or desired.

The total transformer capacity of the machine is approximately 360 k.v.a and the electrical connections are so made that the thirty-one (31) transformers are divided between the phases of a three phase circuit, there being ten each on two phases and eleven on the third phase. This gives a very nearly balanced load on the three-phase circuit and connections are so provided and made that this balance may be practically maintained regardless of the number of transformers or units being used on any particular fabric. One motor is used for driving of all mechanical parts and when the large number of necessary movements and the timing of these movements is considered, you will agree that the successful co-relation of all of these operations and movements is a feat from which the designer should derive considerable satisfaction.

A machine of this type will weld fabric with longitudinal wires from approximately No. 14 to No. 0 and with transverse wires up to approximately ¼ in. in diameter. Another similar machine is capable of handling mesh up to 124 in. in width with maximum diameter of longitudinal wires ⅜ in., minimum diameter approximately 0.135 in. and transverse wires up to 5/16 in. in diameter. This particular machine is equipped with thirty-two (32) transformers and has a total rated transformer capacity of 750 k.v.a. This machine is equipped to automatically feed and straighten all longitudinal wires from reels and feed, straighten and cut all transverse wires up to approximately ¼ in. in diameter. When larger diameter transverse wires are used, an automatic magazine feed is employed which receives pre-straightened and pre-cut lengths of wire. Same variation in mesh sizes may be obtained on this machine as on machine just described. To give you an idea of the production which may be obtained, either of the above machines may be operated at speeds as high as 30 or even 35 cycles per minute; that is, 30 or 35 transverse

wires welded to all the longitudinal wires per minute—this being on fabric for 9 and 10 ft. road reinforcement. The tonnage which may be obtained for a given period of operation depends largely, of course, not only on the speed of operation of the machine, but also, on the number of longitudinal wires employed in the fabric being welded and the spacing of the transverse wires. Obviously, the longitudinal wires generally being larger in diameter than the transverse wires, the more longitudinal wires which are used and within reasonable limits, the greater the spacing of the transverse wires up, say to 12 in., the greater the tonnage obtained for a given speed of operation of the machine and high speed operation may be used readily with 12 in. spacing of transverse wires.

Oft-times, an inquiry for a fabric welding machine will specify a fairly narrow width and of course, a machine to accommodate only a narrow width which is generally made of fairly small wires, is somewhat less expensive than a machine to handle twice this specified width. However, anyone considering fabric welding equipment should anticipate his future requirements and if finances permit at that time install a machine capable of handling not less than 100 in. width, as these machines may be equipped and in fact have been equipped with automatic slitting devices which slits the wide fabric into two narrower strips of fabric so that the production obtained from a wider machine can be double that obtained from narrower machine and the use of the wider machine permits the manufacture of fabric such as is used in road work and for which the demand is constantly increasing. Machines may be supplied which would permit not only making a double width of fabric but a triple width and the initial cost of a machine accommodating say a 100 in. wide fabric is not twice that of a 50 in. or 60 in. width machine. This applies particularly where the inquirer wishes to use a narrow machine for fabric made from the larger wires such as No. 0 and No. 000 as well as the small wires used in fencing and light construction work. The field for this metal fabric is constantly increasing and the demand for machines of the automatic type for fabric up to 12 ft. and even 14 ft. has already arisen and the next few years will, no doubt, see several of these larger machines installed.

Cement Block Forms and Shaking Device Are of All-Electric Welded Construction

The manufacture of cement block forms has been successfully undertaken by a welder in the far west. Fig. 1 shows three electric welded forms used in making concrete building blocks which were recently fabricated by the Smith Welding Works of Monrovia, California. By the application of welding in their construction, these forms prove more capable of withstanding hard usage than those previously made by riveting and bolting, and furthermore, considerable saving in weight in the finished form was also realized.

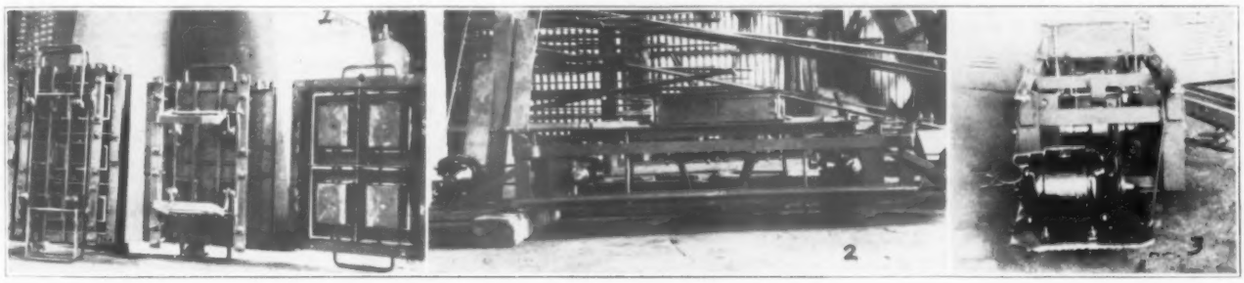


Fig. 1 Shows Concrete Block Forms. Fig. 2 and Fig. 3 Are Side and End Views of Welded Shaking Device.

Frames for the forms are of ⅛-inch angle iron welded to ordinary ⅜-inch plate for the dividing sections. As noted in the picture, each form is made to hold four cement blocks. The forms for making the center holes in the blocks are cut from ⅜-inch boiler plate and welded in square shape 3 by 4 inches. Reinforcing and strengtheners for the framework are ¼-inch bars. Handles for releasing and lifting the forms free from the concrete blocks when completed, are attached and function by a specially designed lever arrangement which provides for ease in operation.

In operation, when the forms are filled with the wet cement, they are set in a specially constructed shaking machine which settles the concrete into the forms without the necessity of hand tamping. This shaking device, shown in Figures 2 and 3, is also of all-welded construction. It is constructed of ¼-inch angle iron for the top lengthwise members on which the framework of the forms rest. Two-inch angle irons form the bottom lengthwise members with 1½-inch strap iron used for the top part of the main frame of the shaking device. (See Figure 2 for side view of the shaking device.)

The shaking operation functions by a cam, the shaft of which is also welded into the frame. This cam, as it turns on the shaft, contacts with a piece of strap iron suspended from a two-inch channel iron welded across the top of the frame giving the vibrating or shaking effect.

The upper part of the frame on which the block forms rest in filling, being made of spring steel and so adjusted that the weight of the cement in the forms automatically spring the forms down to contact with the cam, causes the shaking motion which settles the cement.

The cams are placed at each end of the shaking machine to provide equally divided shaking effect. This feature is easily seen in the end view of the frame, which is Fig. 3 accompanying. These cams are operated by one-half h. p. motors, one being located at each end of the device as noted. The cam shafts are fastened into the frame by means of welding a two-inch angle iron inside the frame to which are bolted the bearings for the shaft.

A.S.T.M. Invites Criticism on Tentative Standards

The American Society for Testing Materials has recently completed two tentative specifications covering the use of welding processes on which criticism is invited before their formal adoption as standards.

The first of these covers the electric-resistance-welding of steel pipe and is designated as tentative specification: A135-31 T. The scope of the proposed specifications is intended to cover steel pipe of two grades, i. e., soft and medium steel intended for bending, flanging and other special purposes, and for the conveying of vapors and liquids. Process of manufacture, chemical composition, ladle and check analyses of the steel are noted, as well as a wide range of tests to develop the physical properties of the material, such as tension and hydrostatic tests, etc. The specifications also

includes detailed items on weights, dimensions and permissible variations; workmanship and finish; protective coating, as well as inspection and rejection.

Electric-resistance-welding steel pipe is covered in tentative specification: A 134-31 T, which covers the same items as mentioned for resistance welded pipe.

The A. S. T. M. standing committees responsible for the preparation of these standards feel that only by consideration of criticism freely offered can the best standard be evolved. Any one interested in commenting on either of the two tentative specifications can obtain copies by communicating with the American Society for Testing Materials, 1315 Spruce St., Philadelphia, Pa.

Band Saws Reclaimed by Longitudinal Weld

Business is good at the plant of O. J. Lougheed & Son, Inc., in Portland, Ore., because even though the longitudinal welding system for reclaiming band saws is new, the sawmills which have already learned of it are keeping this firm "humping." "We are prepared to 'hump,' with plenty of room in the shop and space to expand. We will run three shifts, if necessary," stated Mr. Lougheed recently. "When I began to experiment in welding saws fourteen years ago, I gave some thought to longitudinal welding, but it was only recently that the process was studied again and a practical means of doing the work perfected. Any saw in reasonably good condition which has been worn down until it is too narrow for further use, can be reclaimed by welding a strip on the back of the saw. Our first longitudinal welding job was for the Southeast Portland Lumber Co., Portland. The company sent us three band saws, which had been worn down to 11-inch widths. We welded a strip on the back so that the reclaimed saws were 14½ inches wide, in place of the 14-inch width when they were first fitted to the band wheels. The three old saws, which would have been discarded, were converted into two saws which will serve just as efficiently as any saws of equal width. "I am very pleased with the Lougheed Longitudinal welding, which I believe is going to be a big thing," said J. Finnell, head filer of the lumber company.

"In longitudinal welding, we first cut out the brazes and then butt weld in a piece to restore the saw to its first length. Broken teeth are also replaced with new teeth, welded in. A strip of saw steel is then welded on the back of the saw to restore it to any width desired. As a rule we can make two saws out of three old ones, or three saws out of four old ones.

"Following the welding, the saw is carefully ground, with special attention paid to the backs. A special machine, which I designed for this work, has been built. This machine surface grinds, polishes and back grinds the saw. The saw is heat treated in a specially designed furnace and is benched the same as a new saw. In fact when the saw goes out on the job it looks just about like a saw that has never been used.

"The first butt welding on a band saw was done by us for the Clark & Wilson Lumber Co., of Portland. Since that time butt welding has come into general use. Likewise we have developed the welding of circular saws to substantial proportions. Longitudinal welding, or the reclaiming of old band saws, is the most important development, I believe, relating to saw welding. It offers substantial savings to the sawmill operator and provides a saw which the filer can easily handle. Tests conducted by us show that the steel in a saw that has worn until too narrow for use is just as good as when it was first put in service. Thus the material, of which the reclaimed saw is built, offers a long life and satisfactory service. Much of the work of conditioning and handling the longitudinal welds is handled by my son, L. S. Lougheed. Our branch in Vancouver, in charge of Ted Milne, will probably be put in shape to do this work shortly."

The Merits of Welding Account for Its Progress

By D. R. Gunderman

This is an account of how the North Woods came to be "welding minded." Five years ago the management of our Company, operating one of the largest hardwood sawmills in the world in conjunction with extensive wood-working and by-products divisions, had little if any faith in the present or future value of welding.

Their shop at that time was equipped with one cutting and welding outfit of dubious make and showing evidence of negligent care. Perhaps the combination of these two facts had a direct bearing on the attitude of the company officers toward welding in general and in their shops in particular as results certainly had not been forthcoming.

Today, after saving thousands of dollars in actual money and time lost, our shops are equipped with three welding and two cutting torches in addition to an acetylene generator and sufficient regulating equipment.

The company's investment in this equipment did not result from an immediate reversal of opinion regarding welding and its virtues, but as the result of growing confidence due to successful accomplishment and increased demands on the welding department after a start in the right direction.

In addition to the huge sawmill, our shop is called upon to service the planing mill, flooring mill, power plant, dry kilns, and the re-grinding, drying and sifting departments of the by-products divisions. Also eight locomotives, car shop, numerous steam log-loaders, steam shovel and gasoline shovel are kept in repair. We also maintain a job shop for the surrounding farming community within a radius of twenty miles.

Bronze welding, hard surfacing, and gear-tooth welding are continuous sources of saving. Incidentally within the past year we have undertaken the welding of saws, which has proven to be a great economy and the replacement of broken teeth in band and circular saws has become standard practice.

Recently we had a rebuilding job on one of the "hog" cylinders in the saw mill. These cylinders are made of two castings bolted together to form a "V" five feet in diameter on the outer edges. The steel casting weighs approximately one ton. High speed steel knives are bolted into the sides of the cylinder. These knives are set up with the proper clearance to pass the stellited edges of a throat plate which fits into the bottom of the "V" shaped cylinder. The refuse and waste falling into the cylinder is reduced to chip form from where it goes for fuel in the boiler room.

The casting was worn back from the bottom of the "V" for a distance of about five inches, tapering from ⅝ inch at the bottom to nothing at the walls of the cylinder.

The "die-hards" predicted failure of the welding job due to the strains set up and also to the supposed excessive vibration from being out of balance, since the cylinder operates at 900 R.P.M.

However, after applying 40 pounds of Hascrome to the worn sections, the cylinder ran as true as ever. Incidentally, no grinding or finishing was done as the job was welded at the mill with the cylinder mounted on the shaft and setting in the frame.

The welding department has reached into the maintenance and repair of every phase of the logging and lumbering operations. The management is more than pleased because their confidence in their investment has been justified. Welding in the North Woods is paying dividends.

Line Production Car Cutting*

How Eight Hundred Freight Cars Were Scrapped in Ten Weeks by Eleven Cutters, Most of Them Without Previous Experience with the Cutting Torch

By T. M. Hamer†

THE following notes will cover some observations made in connection with car scrapping operations which occurred in 1931 in the middle west. No attempt is claimed for an exhaustive treatise of the subject.

The scrapping of obsolete rolling stock, at a time when car loading requirements have shown a considerable decrease, enables railways to liquidate a part of such investment which is not gainfully employed, and to provide employment for labor.

It is noted that the primary cause of scrapping is obsolescence, and that the equipment need not be worn to the point where it is no longer serviceable, before scrapping operations become profitable.

A choice occurs of selling the cars to a scrap dealer, or arranging with a contractor to scrap the cars, or of having the cars scrapped by the railway employees.

Sometimes railway companies elect to sell their cars to scrap dealers specializing in work of this kind, and the railway company is relieved of this responsibility. On the other hand, the scrapping operations enable the railway to retain some of their employees who might otherwise be dismissed. By having the work done at various points on a railway, the money is spent in communities which are served by the railway, and this tends to bring more business to the railway than if employment decreases in such communities. A further advantage occurs sometimes in that the railway can economically reclaim or use various parts taken from the scrap pile.

In systematizing the demolition of railway cars, the line production method presents itself as logical. Instead of demolishing a car at one spot, the car is moved successively to a series of positions, at each of which one part or another of the car is removed or dismantled. A suitable yard track is set aside for this purpose, adjacent and parallel to a second track on which a travelling crane can operate to load the scrap, and with sufficient clearances to permit the unincumbered operation of the crane. (See Fig. 1.)

It is advantageous for the track to have such gradient as to permit the easy movement of cars from one position to the succeeding positions, without the assistance of a locomotive, and without undue exertion of labor. Yet the gradient should not be great enough to permit a car starting to move of its own accord, or to result in difficulty of stopping a car when it moves from one position to the next.

At the first position some part of the superstructure is removed, and parts of the car are removed or dismantled at each succeeding position, until the trucks only remain and finally only the wheels are rolled to the end of the track.

(Figures 1-4, Above) Figure 1. End of Scrapping Line. Figure 2. Cutting Bolts to Remove Roof. Figure 3. Removing Roof. Figure 4. Side Boards Removed. (Figures 5-8, Below) Figure 5. Removing Framework of Superstructure. Figure 6. Removing Airbrake Equipment. Figure 7. Dismantling Trucks. Figure 8. Cutting Bolsters.

Following is an example of the set-up used in one case for scrapping wooden box cars, at the average rate of 16 cars per day.

Position No. 1. Cutting of bolts, nuts, and rods to permit the latter removal of roof and sides. The average cuts were on about 170 ½ in. and ⅜ in. bolts and nuts and 12 cuts on 1¼ in. rods.

Two cutting operations were used at this position, and the average consumption was one tank of 220 cu. ft. oxygen for 9 cars, and one 250 cu. ft. tank of acetylene for 36 cars. Scaffolding was erected at this position for operators convenience in cutting.

Position No. 2. Cutting of transom and draft bolts, involving an average of 10 1-in. rods, 200 ¾-in. bolts, 2 ⅞-in. rods, and 24 ⅝-in. bolts.

Three cutting operators were used at this position, the average consumption being 10 cars per cylinder of oxygen and 50 cars per cylinder of acetylene.

Position No. 3. Roof of car removed (see Fig. 3).

Position No. 4. All end lining of car removed.

Position No. 5. All side lining removed.

Position No. 6. Side boards removed (see Fig. 4).

NOTE: No cutting operators were required at positions 3, 4, 5 and 6.

Position No. 7. Removing superstructure framework (see Fig. 5).

56 cuts on ⅞-in. side post rods
28 cuts on ¾-in. car line rods

One cutting operator was assigned to this position, using one cylinder of acetylene to 84 cars and one cylinder of oxygen to 14 cars.

Position No. 8. Floor boards removed. No cutting operator was required at this position.

Position No. 9. Removing airbrake cylinder, draft arm,

*Read before the 32nd annual convention—International Acetylene Association, Chicago, Illinois—November 11, 12, 13, 1931.

†Air Reduction Sales Company, New York City.

transom, and cutting under-frame bolts, with an average of following cuts:

4 bolts 1¼-in.	12 arms 1¼-in.
16 bolts 1½-in.	10 bolts 1-in.
8 bolts ⅞-in.	86 bolts ⅝-in.

24 bolts ¾-in.

Two cutting operators were assigned to this position, using one cylinder of oxygen for 7 cars, and 1 cylinder of acetylene for 42 cars.

Position No. 10. One cutting operator, removing sills, cutting an average of 16 bolts ¾-in. per car. Operator performed other work, as cutting was a very minor part of this position.

Position No. 11. Dismantling trucks (see Fig. 7), average cutting:

32 bolts 1¼-in.	32 bolts ¾-in.
32 bolts 1-in.	16 bolts ⅝-in.

26-in. of ½-in. thickness

One cutting operator was assigned to this position, using one cylinder of oxygen for nine cars, and one cylinder of acetylene for 56 cars.

Position No. 12. Cutting bolsters (see Fig. 8). One operator (cutting) was used at this position, using one cylinder of oxygen for 34 bolsters, and one cylinder of acetylene for 238 bolsters. After position No. 12, only the car wheels remained on the track (See Fig. 1).

It will be noted that 11 cutters were employed on the above line up, for scrapping 16 cars per day, exclusive of other labor. These 11 men assisted on other work besides cutting, when opportunity occurred. Most of these 11 cutters had never used a cutting torch prior to this assignment, as they had been employed in departments involving actual train operation, and other work where the oxy-acetylene cutting process is not used.

Most of the crew had to receive their first instructions in handling the cutting torch when they came on the job, and consequently the production of 16 cars per day was not achieved at the start.

However, 800 cars were scrapped in approximately ten weeks, and except for occasional or unavoidable delays and interruptions, the rate of 16 cars per day was achieved, and maintained with comparative ease. At the rate of 16 cars scrapped during an 8 hour day, it is noted that the average length of time per car per position was 30 minutes, since each car moved forward along the line each 30 minutes, the advantages of line production work became apparent in that the crew at each position was working against time, and the men at one position were aware that a delay on their part would adversely affect the production of the entire line.

Piece work rates were developed for this work, on a basis which would permit that the material used in scrapping the cars, such as oxygen and acetylene, be charged against the men using these supplies. This plan resulted in the economical use of material, just as piece work promotes the economical use of time. More careful thought was given to proper tip sizes, and gas pressures for cutting purposes, than is usually the case, in order to decrease gas consumption without increasing cutting time. The operators learned, of course, that tip sizes, and gas pressures could not be reduced below a certain degree without unduly increasing the time element. The number and size of preheating jets on the cutting tip were not reduced below those normally used, because of the paint, rust, and dirt which would interfere with the cut if the preheat were unduly reduced. It was possible to convince the operators that high gas pressures, are not necessary in the preheat mixture, and these were maintained at lower pressures than usual.

Some discussion developed as to whether it is best to reduce the oxygen cutting jet pressure, or the diameter of the orifice, in establishing economical practice. It was possible to use a smaller cutting jet orifice than generally has been used in car scrapping, making a narrower kerf, but the oxygen cutting jet pressure was not materially reduced, because the operators claimed they could not otherwise blow slag dust, etc., out of the path of the cut.

An advantage of the line production method occurs in that each operator can set his gas pressures at the most economical cutting for the position to which he is assigned, and does not require to change pressures or tips to get economical results, as would be the case if one operator did the cutting for an entire car.

Another advantage in the line method is that the scrapped material is more easily sorted and loaded than if a car is demolished in one position.

Almost all the different materials found in the scrap pile were reclaimed or sold as scrap or used even if only as kindling wood.

The Bridge and Building, Maintenance of Way, and the Locomotive and Car Departments all found occasional uses for various parts of the scrap material.

In conclusion, it is interesting to note that the oxy-acetylene cutting process plays an important part in the scrapping of wooden box cars, as there is still considerable wooden equipment which will find its way to the scrap pile in the next few years.

Radio Tube Is Huge Welding Project in Miniature

That the production of a radio tube parallels a tremendous industrial task, in miniature, was pointed out by George Lewis, vice-president of the Arcturus Radio Tube Company, Newark, New Jersey, at a recent meeting of industrial engineers.

Aside from the numerous fine elements used in the construction of a tube which could be termed analagous to minute girders, braces, cross-members, etc., there are 186 various spot welds in the final assembly of the elements.

This is equivalent to the number of welds required in laying a ¾-mile pipe line, with each section of pipe 20 feet long. This would be sufficient to weld all steam and water pipe connections in the average home; or, in the marine field, to weld a mammoth anchor chain 93 feet long for one of the big ocean liners.

Does Anybody Else Use the Metal Spray?

By D. D. DeTrow

The metal spraying device is a small, portable unit carried in the hand and used as one would use any compressed air spray for paint. This spray uses the oxy-acetylene flame for atomizing the metal to be sprayed and compressed air to carry the molten metal to the surface to be coated. When properly applied to a surface that is clean and well sand-blasted the coating can be turned and is water-tight as well. In our work we are required not only to make good, clean welds but also to make them attractive. Our all-welded iron drinking fountains are made from scrap material at times when we are not busy. We are using sulphur water from a very deep well that is always cold and clear but is very hard on iron. Paint does not appear to wear well and to-date the most lasting finish that we have tried is a coating of zinc or aluminum applied with the metal spray.

We find that tin or copper applied to the blades of water rheostats prevents corrosion and increases current conduction. Copper can be applied to the inside of the modern heat exchangers using a boiler flue gas wherever there is a precipitation of sulphuric acid. I believe that this same tool is used to apply metal to glass. I will be glad to get more information on this subject and also to hear from other welders who are using this tool in order to swap experiences.

Welded Hip and Valley Roof

Field Welding Increased Rigidity and Strength, Reduced the Number of Component Parts and Simplified the Connections

By F. W. Jacoby†

TO BUILD for beauty, utility, and permanence, is a laudable undertaking, and he who strives to attain these ends, regardless of the impulse, not only enhances the value of that which he builds, intrinsic and otherwise, but establishes a plane of accomplishment that shall endure through the ages, and develops within the minds and consciousness of men, a spirit of emulation, retaining unto himself a full measure of satisfaction in having done things well.

Located in semi-tropical south Florida, at Red Hill, Highlands County, the John A. Roebling estate comprises an area of nearly two square miles of rolling virgin land.

As the key building of a contemplated group, which when completed would adequately establish an estate of proud proportions, providing maximum utility and homelike surroundings, the building here described, must stand out as a gage of achievement; a measure, as it were, setting the standard of construction for all.

This building, 40 x 320 feet, is of reinforced concrete, from foundations to roof, comprising one unit for a workshop, five units for storage purposes, and two units for offices and residence.

The steel roof frame consists of monitors framing on trusses, and trusses supported on steel columns for 7 units, with valleys between the units; and the residence roof, at the south end elevated one story, consisting of five trusses, with I-beam hips and rafters; all supporting 5 in. channel purlins designed to take a 3 in. porous concrete base roofing, with three ply waterproofing, and clay tile, figured at 100 lb. per square foot dead load.

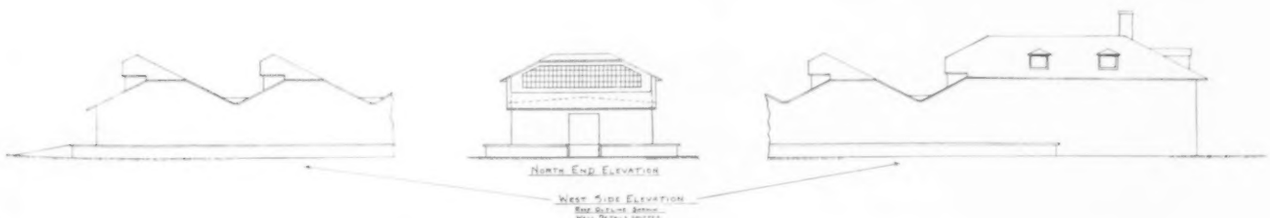
Alexander Blair, Civil and Construction Engineer, of Westfield, N. J., who designed the building, was also in charge of operations; Cass Bros., Lake Placid, Fla., General Contractors; and F. P. Lyons Iron Works, Inc., Tampa, Fla., supplied the fabricated steel, and supervised the erection, the writer being in charge.

Columns and trusses were shop riveted as called for in the specifications, but when it became necessary to determine the best method for field erection, the advantages of electric arc welding, for a cut up roof frame of this type, were presented to Mr. Blair. Since there was no local building code to consider, he immediately agreed to permit this modern method to be used for the superstructure. This change obtained a greater rigidity and strength with fewer component parts; the simplification of connections which would have been difficult and unsightly if designed for riveting. A ready means for making changes in the design was provided to accommodate additions and alterations that might prove necessary or advisable as the construction proceeded; and last but not least, an improved appearance was obtained, for the steel was to be exposed inside of the building for the greater part, and its appearance had to be in keeping with that of the other component parts of the building, in order to show up to advantage with glazed tile walls, bronze window and door frames, and plate glass glazing, and all other appointments of the most up-to-the-minute material and construction.

The work being 125 miles from the fabricating plant, taking care of additions and alterations would have entailed considerable delay and expense, so that, whenever the occasion arose, the acetylene torch did the cutting, and the electric arc made the connection with neatness and dispatch, amending the Lyons Iron Works slogan, "Steel when you want it", to read, "Steel when you want it, and where, and HOW!"

Ruggedness and appearance were considered prime requi-

†*Structural Engineer, Tampa, Fla.*



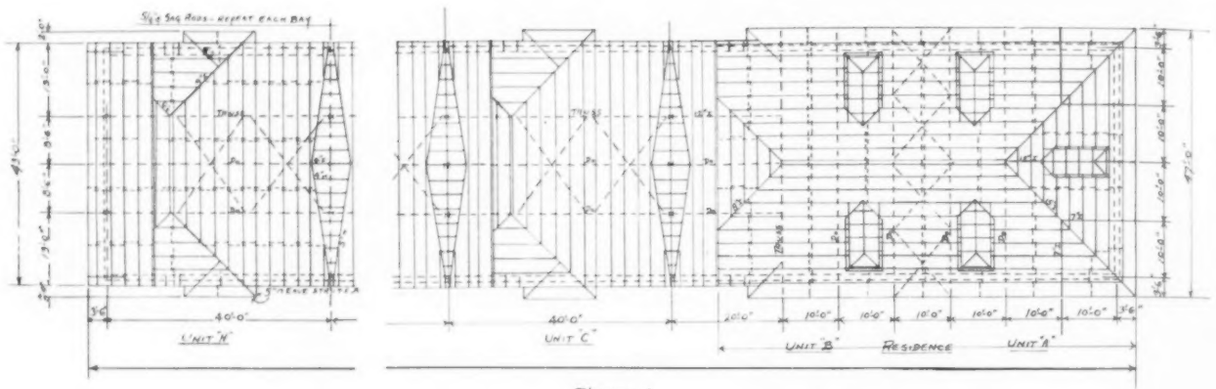
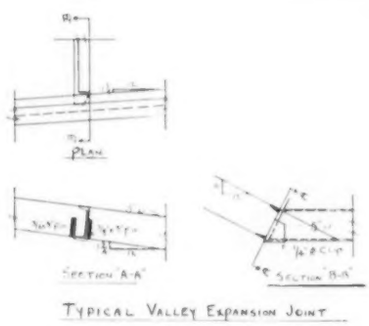


Figure 1



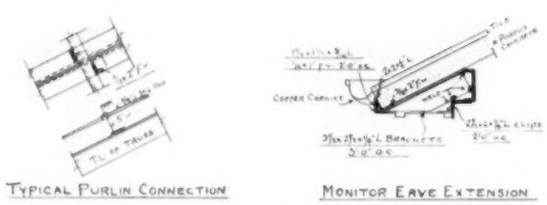


Figure 2

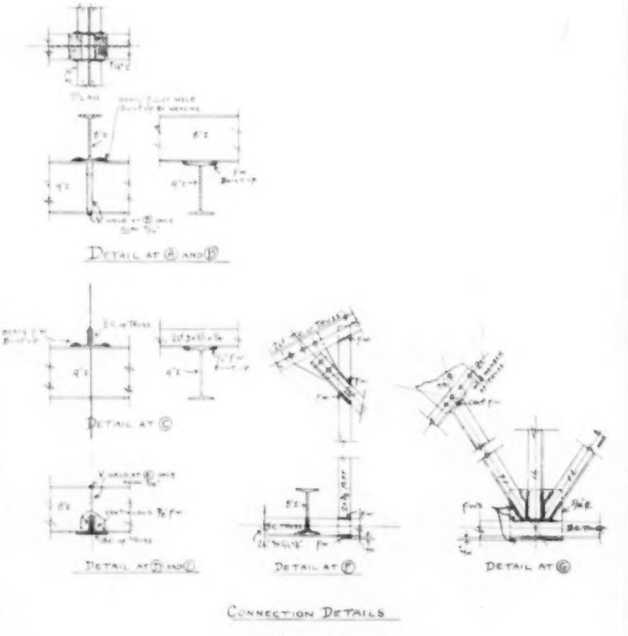


Figure 3

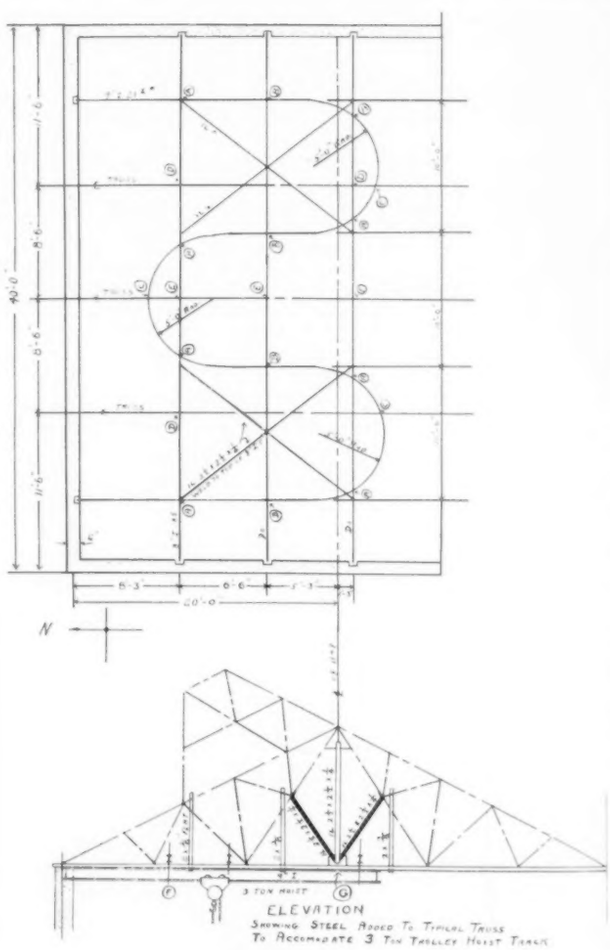


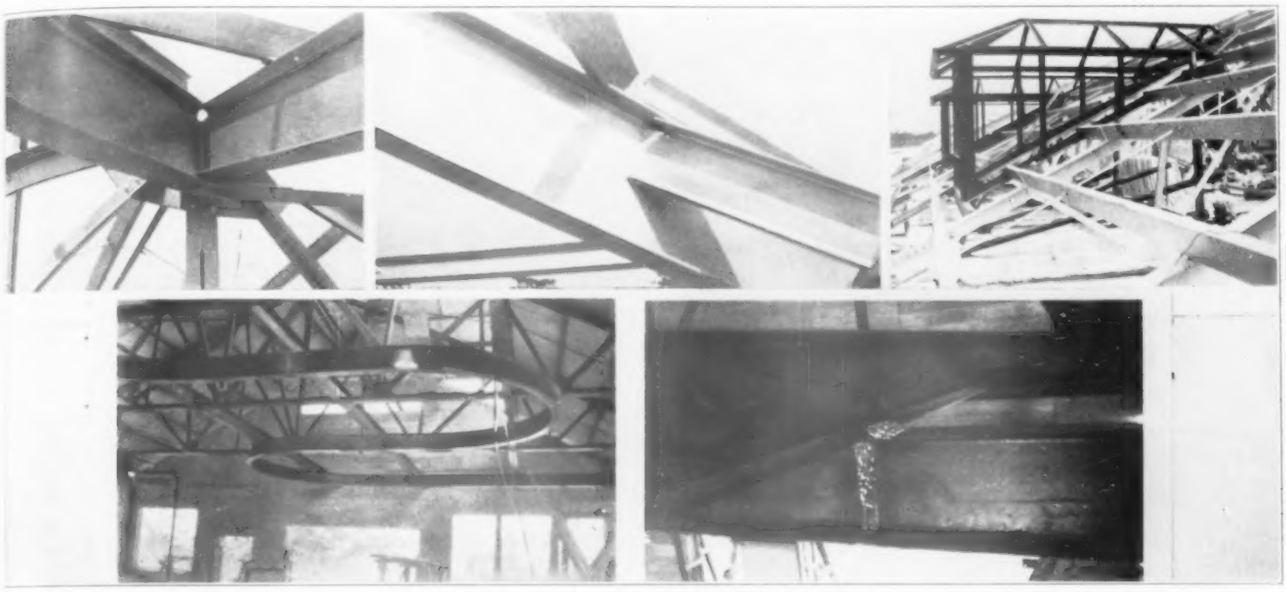
Figure 4

Figure 1 Is a Drawing Showing Details of the Entire Building. Units "D" to "G" Have Been Omitted Since They Are Identical to Unit "C." In Figure 2 Details of Various Roof Joints Are More Clearly Shown. Figure 3 Gives Working Details of Trolley Hoist Connections, Drawing for Which Is Shown Complete in Figure 4.

sites throughout the construction, and welds were made with this idea in mind. The result was a greater weight of welding metal in proportion to the weight of base metal involved, than would have been the case if strength of connection only were considered.

There was no electric current supply available at or near the site of the job, so the welding current was supplied by a 6-cylinder, gasoline engine driven direct current generator,

Welding the purlins proceeded with dispatch, as the operator could change from point to point without much trouble, requiring no special scaffolding. Three-eighth inch fillet deposited amounted to 3200 lin. inches, in 52 man-hours actual welding time, using 150 lbs. of welding rods, which includes a wastage of 38 lbs. for stub ends, or a net weight of 112 lbs., making 28 in. of fillet deposited per pound of welding wire used effectively.



(Above, Left) Concentration Weld of Three Hips on South End of Roof Which Includes Two 15-Inch and One 12-Inch I-Beams. (Center) Seven-Inch I-Beam Jack Rafter Welded Into 15-Inch Hip Beam. (Right) Dormer Frames on South End of the Roof. (Below, Left) Two Loops of Trolley Hoist Installation. (Right) Butt Weld in 9-Inch I-Beams for Trolley and Built-Up Lap Weld Between 9- and 8-Inch I-Beams.

mounted on a truck chassis, which was moved from point to point on the ground level as the occasion required, with Joe W. Wagner, Sebring, Fla., welding. He had qualified as an expert welder on several previous welding jobs.

The operation was based on the Code for Fusion Welding and Gas Cutting in Building Construction, by the American Welding Society Committee on Building Codes, Part A-Structural Steel, Edition of 1930.

The size, style and location of welds was indicated to the welder by sketches, and by the writer in the field, who also tested and inspected the completed welds in accordance with the latest practice for visual inspection.

Welding rods used were 5/32 in. coated, meeting Code specifications. The majority of welds were 3/8 in. fillets, excepting at critical points, and for V butt welds, when the weld was built up to provide the necessary strength.

The 5-in. channel purlins framed on top of the top chord of the trusses, and the top flange of the hip beams in each case. To facilitate erection, the bottom flange of the purlin and the top chord of truss, were punched for ½ in. erection bolts, one for each bearing, reducing the field operation to bolting up the purlins. The welder then ran 3/8 in. fillet welds as shown in Figure 2. This held the purlin rigid in proper position, and compensated for the omission of the usual purlin clip. Wall bearing purlins were welded to plate anchors set in the wall.

The 5-in. channel eave struts were also bolted for erection only, using small angle clips to the purlin ends, and then, after alignment, top and bottom flanges were welded with 3/8-in. fillet welds.

The current used varied from 175 to 200 amps, according to the nature of the welding requirements, with a voltage around 20, and the welding arc maintained at the proper length for a proper deposition of weld metal, and penetration of base metal to insure a good weld without burning or unduly hardening.

Setting up and welding the hips was a relatively slower operation, requiring scaffolding at each location. The I-beam sections were shop cut to the proper bevels and for clearance, and provided with bases for wall anchor bolts, so that it was only necessary to hoist and guy them in position against the members to which they were to be welded, then tack welds were made, the alignment checked and the permanent circumferential fillet weld finished. This made a very stiff and good looking connection, not obtainable by the usual bent plate and rivet system, as illustration shows for one location. While the length of the weld required to take care of the stresses in each case, did not equal the peripheral contact line of the members to be welded, for appearance sake it was deemed advisable to make a complete weld. Welding wire used amounted to 180 lbs., which includes 46 lbs. wastage, or a net weight of 134 lbs., to make 4900 lin. inches of fillet, in 74 man-hours actual welding time, making 36.56 in. of fillet deposited per pound of welding wire used effectively.

Another area which would have caused considerable grief to provide for riveted connections, was the valley between each bay. Three planes would have to be considered in fabricating for bent plate connections, and holes made to match for field riveting. All that was necessary in the field, was to locate the different pieces that had been cut to length and fitted in the shop to a templet, spot weld, check alignment and then make the permanent weld. In addition, for every other bay, an expansion joint had to be provided for along one contact line of the valley with the main roof, and saddles were welded in to take care of this feature.

After the main frame was erected, it became necessary to run a curb angle outlining the entire roof area, and add eave extensions for the overhanging of roof over the monitors in each bay. For this work, as well as for a considerable number of angle clips for fastening the copper cornice and other light angle work around the building, "C" clamps were used to set the work for the welder, and jigs for all

pieces that repeated in detail throughout, thus saving considerable time, and allowing the set-up crew to keep the work ahead of the welder.

The dormers on the south end of the building, each frame weighing 1300 lbs., were shop welded, shipped complete, hoisted to the roof and welded to the channel wells provided for them in the roof framing.

An unusual arrangement for a trolley hoist installation in the work shop unit at the north end, is shown in plan and illustration (Figure 4). It was necessary to make the application of this additional framing to the existing trusses, without weakening any member by drilling or cutting, which was accomplished in a neat, strong, and stiff manner as shown. The aim was to make the installation as rigid as possible, and reduce vibration to a minimum for handling a 3 ton load. The trolley track, a 9-in. I-beam, was bent to a 5 ft. radius for three segments in the shop, clamped in place in the field to the supporting steel, butt ends of joints prepared for V butt welds, leveled and trued up, and then welded. The welds at the crossovers and critical points, were built up by weaving across several parallel overlapping fillet welds, penetrating deeply into the base metal, and properly fused, thus building up the throat of the weld for strength.

Particular attention was paid to obtaining good penetration, applied to a greater area of base metal than usual. The strength of the resulting connection was considerably in excess of the requirements for the contemplated load, because it was deemed prudent to err on the side of safety, to provide for shock and a possible reduction in the efficiency of the weld not discernible by the usual visual inspection method of testing.

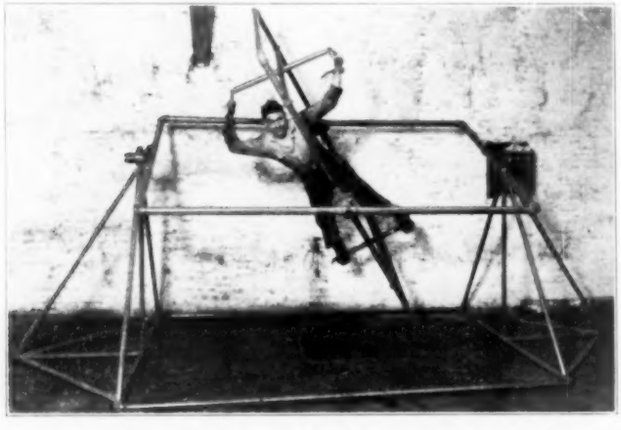
Following is a summary of some of the results obtained:

Welding metal (Total used including wastage)		
⅜ in.	705	lbs.
Welding metal (used effectively) 85%	595	lbs.
Total structural steel (riveted and welded)	92	tons
Structural steel (welded)	55	tons
Actual welding time (man-hours)	530	hrs.
Total length, ⅜-in. fillet	16,750	lin. in.
Total length, ½-in. fillet	745	lin. in.
Total length, ¾-in. fillet	585	lin. in.
Total length, 1-in. fillet	463	lin. in
Total length, all fillets	18,543	lin. in.
Fillet deposited per welding man-hour, 18543/530	34.98	in.
Fillet deposited per lb. of wire used effectively, 18543/595	31.18	in.
Welding man-hours per ton of steel welded, 530/55	9.64	
Welding metal per ton of steel welded, 595/55	10.82	lbs.
Gasoline and oil used (Total, incl. idle running)	1,210	gal. gas.
	108	qts. oil
Gasoline and oil used (effectively) 70%	847	gal. gas.
	75	qts. oil

While no attempts were made to make a welding speed record, the point to point method of construction precluding any such attempt, the benefits anticipated were fully realized. This operation requiring precision of alignment, finished appearance of exposed steel, and the effective handling of a multiplicity of bizarre connections for the weight of steel involved, clearly demonstrated the flexibility of the electric arc welding system for regular as well as unusual fabrication details.

Exercising Machine Is Welded Structure

An interesting type of exercising machine has recently been invented by A. W. Pruitt of Athens, Ga. This is a swing somewhat similar to that used in an aviation school for training flyers. The inventor claims that ten minutes in the morning and ten minutes in the afternoon spent in this machine will show definite progress in reducing weight well inside of a couple of weeks. In the illustration, the inventor is shown in one of his machines. He is standing on two steel plates which fit his feet, and his feet are strapped in. His arms are strapped to the top bar, and he holds to the hand-grips just above his head. A leather strap also circles his body. By simply tilting himself in any direction, he sets the machine in motion. The horizontal bar turns the rider head-over-heels left to right, or right to left. Simultaneously the vertical bar turns him head-over-heels forward or backward. Thus the person is turning in two directions at once.



A. W. Pruitt "Reducing" in All-Welded Exercising Machine.

The exercising machines weigh between 250 and 300 lbs., being made in several different sizes. It is all steel welded together and equipped with ball bearings. A few fittings are, of course, necessary to make it possible to take it apart for shipment, but all permanent connections are solidly welded.

Oxy-Acetylene Committee Finds Much Progress Made

The fourth annual report of the Oxy-Acetylene Committee of the International Acetylene Association presented at the convention held in Chicago, Nov. 11-13, records a year of progress in the many phases of the oxy-acetylene process. This is seen many ways. The trend in the past year has been toward the free acceptance of the oxy-acetylene process as a dependable major construction tool. For example, there has been an ever increasing mileage of welded pipe lines laid; the Boiler Code of the American Society of Mechanical Engineers has been revised; welding has appeared as a very definite sealing point in the advertisements of many metal products and ever increasing emphasis has been placed on education in the oxy-acetylene art by technical and vocation schools.

In the apparatus and accessories used there has been a noticeable trend of advancement. Equipment has been developed and readily accepted which serves for one purpose or for uses which are very similar in principle. Higher welding speeds have evolved better welding materials and the higher strengths demanded and accomplished of the welded joint are responsible for increased confidence in welded construction.

The 68-page report covers seven main divisions among which are included present practices and trends in such fields as manufacturing and construction, transportation, reclamation and repair, structural steel welding, industrial power piping, unfirmed pressure vessels and boilers and many others.

Multi-Flame Torches Cut Costs

Development Work Points Toward Increased Use of Welding Torches Having More Than One Flame on Account of Increased Speeds

IN OXY-ACETYLENE apparatus manufacturing circles at the present time keen interest is being shown in the development of welding torches with tips designed to deliver two or three welding flames instead of the conventional single flame for hand welding. The multi-flame tip is not, strictly speaking, a new idea, having been used for years in automatic or machine welding, and to a very limited extent for hand welding torches. It seems to be one of those ideas which, although founded upon sound principles, has been set aside during periods of strong demand and easy marketing conditions, to await more intensive development and perfection when business conditions became less favorable and new products promised to serve as a stimulant to an apathetic demand.

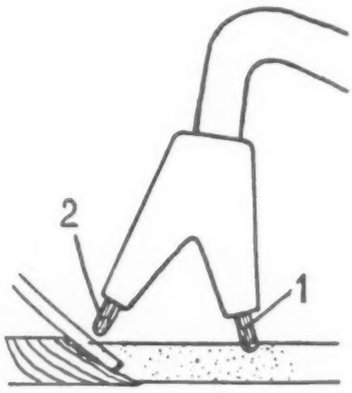


Figure 1.

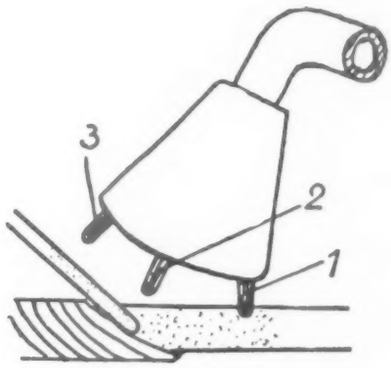


Figure 2.

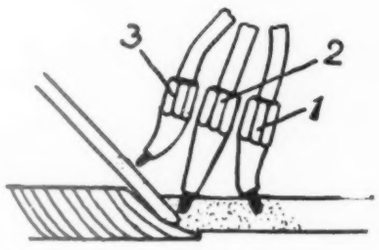


Figure 3.

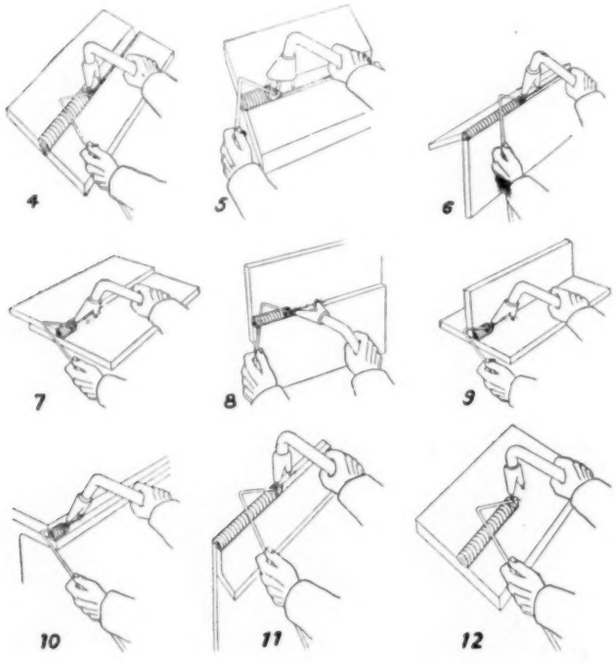
During the past year there have been two developments of particular interest along this line. One of these was the announcement and promotion on a large scale, by one of the large American manufacturers, of a process for pipe welding involving the use of a welding torch with two flames. There have been several published reports of the use of this process indicating high strength joints obtained at remarkably high production rates. Another development was the publication a few months ago of an article in the *Swiss Welding Journal* in which the new Keel multi-flame welding torch was described. (Professor C. F. Keel is a well known international authority on acetylene subjects, and editor of the above mentioned journal.) Here the subject was introduced by the claim that the speed of welding can be increased in the order of from 50 per cent to 60 per cent, with a reduction in welding cost amounting to from 25 per cent to 30 per cent. These figures, vouched for by a recognized authority, are certainly a strong inducement to careful study of the possibilities of this type of torch tip design. The accompanying illustrations, and much of the information and data in the following discussion have been taken from the article referred to, which covers in considerable detail the construction, operation, and advantages to be secured.

Possible variations in the design of the torch to deliver more than one flame are illustrated in Figures 1, 2 and 3. It should be observed that in each case the several flames are set in the plane vertical to the length of the seam and along the line of the seam. The function of each individual flame is also clearly indicated. In all three cases the first flame serves to preheat the edge of the sheet ahead of the weld, without actually melting it; the second flame finishes the melting process and actually makes the weld; and in the cases where a third flame is used its function is to preheat the welding rod. It is claimed that this third flame makes possible the use of thicker rod and that a larger quantity can be melted in a given time. Where only two flames are used the filler rod is melted by the second flame. The triple flame has been recommended for metal 3/8" thick and over, a slightly smaller flame for preheating the filler rod being indicated as desirable.

A basic factor in the success of this method of operation is the distribution of heat along the line of operation. Many welders who have tried to speed up their work by using a larger tip and more acetylene have found that the result is overheating of the metal and an indifferent weld. The fact that flame size is limited by the thickness of the material welded has, in fact, been a lesson that a great many users have been willing to learn only by experience. The multiple flame torch serves the purpose of permitting a larger flame (greater heat volume) by distributing it in such a way as to give a flat flame effect, further improved by a separation of the flames which permits better control of the various steps involved in making the weld. In the case of the Keel torch it is said that torches can be used which consume from 4½ cu. ft. to 5½ cu. ft. of acetylene per hour for each .03" thickness of steel, as compared to a maximum of 3½ cu. ft. per hour with single flame torches. It is the combined effect of more heat per unit of thickness with a better spread of the heat which is the fundamental reason for economies in welding time which have been claimed.

Reference to Figures 4 to 12 inclusive will show how this welding method can be applied to welds of different types. In the case of butt welds with edges of sheets not bevelled it is obvious that less separation of the sheets is necessary; and in the case of bevelled edges that the angle of bevel can be considerably reduced. In both cases this means that less metal has to be melted. The relative positions of the torch tips and the filler rod for all types of welds will bear careful study. With the exception of Figure 5, the sketches show the applications on relatively thin sheets and two flames only are used. Figure 5 covers the case of a butt weld in material over 3/8" thick, where it is considered that the third flame increases the efficiency enough to justify the slight extra cost of construction.

Welding technique with the multi-flame torch is, in general, a rather simple matter. The torch is held so that the line of the flames is at all times along the line of the seam, the heat distribution automatically secured by the use of two or more flames making the customary weaving motions both unnecessary and undesirable. The torch is held in the right hand and the direction of welding is from left to right. The right-hand flame plays into the seam and preheats it and the left-hand flame makes the weld. (The third flame, when used, preheats the welding rod.) When the welder approaches the end of the seam he can twist the torch tip slightly upward to the left so that the finish welding is done with the right-hand flame, thus utilizing the left-hand flame to give a quick preheat to the filler rod.



As the result of a long series of tests made with the Keel multi-flame torch the claim is made that it can be used with 40 per cent more acetylene than the single flame torch for the same thickness of metal. The average increase in welding speed is indicated as 50 per cent under ideal conditions, and from 25 per cent to 40 per cent under practical working conditions. Since a more powerful torch is used, there has been noted no reduction in the gas consumption per unit of length of weld. It is further indicated that the advantages claimed are especially noticeable when working on thicknesses of from ¼ in. to 1 in. Cost of preparation is reduced in a wide range of work by the possibility of welding thicker plates (up to 5/16 in) without beveling. In the case of bevelled plates there has been noted a decreased tendency toward melting through and forming icicles. In all butt welds, also, the dispersion of the heat along the seam and the increased speed greatly reduce the troubles caused by distortion of the sheets. It follows that less separation of the edges on long seams is needed. In Figures 6 to 11 the applicability of the multiple flame to lap, corner and fillet welds is clearly shown, and the position of the torch indicated in each case. Here again it is apparent that the heat distribution takes care of troublesome operating problems which have been encountered when using the single flame torch.

In the construction of torches to operate on the multiple flame principle there are plenty of problems to be solved. The size and form of the openings, the length of the tips, the distance between flames and the size of flames must be balanced nicely to obtain highest operating efficiency. Projections and dead spaces inside the tips must be avoided. Also, the tip should be safeguarded against overheating and backfiring. Then, following the production of satisfactory equipment there will be need for careful development of welding technique, and instructing old operators as well as new ones in the proper use of the new technique.

TABLE I

Number of Flames Recommended for Various Thicknesses of Metal and Hourly Acetylene Consumption.

Thickness in Inches	Number of Flames	Acetylene Consumption in Cu. Ft. per Hour
.04	1	3.53
.08	1	7.06
.16	2	21.19
.24	2	35.31
.32	2	49.44
.40	2	62.57
.47	2	70.63
.59	3	88.29
.79	3	95.35
.98	3	105.94
1.08	3	127.13

With reference to this last mentioned problem, history will probably repeat itself. Skilled operators do not like to change their ways. Their tendency is to carry old methods over into new processes, and many of them have lost their jobs in the past through lack of adaptability to changes, because so many times it has proved to be easier to train new men who had had no welding experience, than to make experienced men follow instructions prepared for new processes.

There remains finally an extensive program of experimentation to determine what fields of application are particularly favorable to each type of torch, and to what extent they overlap. It is anticipated that this development be of real service in extending oxy-acetylene welding applications, and with this in mind it will be watched with growing interest.

Continued Interest Shown at Seventh Purdue Conference

The Seventh Annual Conference on Welding was held at Purdue University, Lafayette, Indiana, December 10 and 11, under the direction of the Engineering Extension Department and the Department of Practical Mechanics. The continued popularity of these welding conferences over so many years has been a source of gratification both to the University authorities and to those in the welding industry who have been cooperating in the preparation of programs and exhibits.

Following is a list of subjects covered in the 1931 Conference:

Trends in the Welding Field—H. S. Card, Editor, Welding Engineer, Chicago.
Recent Developments in Welding Overland Pipe Lines (Illustrated)—Fred Outcault, Development Engineer, Linde Air Products Co., Chicago.
New Developments in the Welding Field—E. W. F. Smith, Consulting Engineer, Lincoln Electric Co., Cleveland.
Welding Rods—G. W. Plinke, Research Engineer, Henry Vogt Machine Co., Louisville, Ky.
Underwater Cutting (motion picture film)—Craftsweld Equipment Company, New York.
Research in the Welding Field—S. C. Hollister, Professor, Structural Engineering School of Civil Engineering, Purdue University.
Symposium—Welding Tests—J. J. Crowe, Engineer, Air Reduction Laboratories, Inc., New York.
Welding Thin Plate—Earl Kelsey, Columbian Stamping and Enameling Co., Terre Haute, Ind.
Control of Economy in Welding Operations—Ernest Lunn, Consulting Engineer, Welding Engineering and Research Corporation, Chicago.
Resistance Welding—M. L. Eckman, Research Engineer, Federal Machine and Welder Company, Warren, Ohio.
Hand and Automatic Welding in Production—W. R. Campbell, Superintendent, Electrolux Division, Servel Inc., Evansville, Ind.
Industrial Applications of Welding (Illustrated)—H. O. Westendarf, Jr., General Electric Company, Schenectady, N. Y.

The demonstrations of processes and applications included: Cutting cast iron, bronze welding with electric arc and gas, applying hard surface metals, atomic hydrogen welding, welding aluminum, welding stainless steel, welding cast iron, resistance welding, automatic cutting, cutting with propane gas, and Linde-weld on Pipe.

A paper of outstanding interest was that presented by Prof. S. C. Hollister, of Purdue University. By the projection of polarized light through celluloid models and putting these models under load, Professor Hollister showed clearly the effect of design upon concentrations of stress when welded assemblies are subjected to various types of load conditions. The lecture demonstrated the possibilities of photoelastic studies as an aid to the designer of welded structures.

As an indication of the success of the conference, it may be noted that over 170 men were present for the opening session and at the close of the conference the total number of registrations had reached 270.

Repairing Broken Castings Permanently

WHILE the oxy-acetylene welding process has long been accepted as a reliable means of repairing broken castings, there are points of procedure which must be carefully followed if such repairs are to be successful and stand up under operating strains after they are placed back in service. A large casting repair job which was recently completed in the shop of Anchor Welding Service, Inc., 4715 West Chicago Ave., Chicago, Ill. will serve as a good example of correct practice in this type of work.

The piece in question was a 3-ton press housing broken in three places. There were two breaks through the upright section. One was 10 x 10 inches in cross section and the other 10 x 12 inches with a wall thickness of 2½ inches.

In considering the various problems of this job, George Hettrick, the proprietor, knew that the part must be accurately lined up and secured in place. Laying the casting on its side, it was rigidly supported on fire bricks and shims until it was perfectly level and the edges of the breaks lined up. Mr. Hettrick uses a method of tacking broken castings which he finds is very successful. When the parts are lined up he runs several tacks across the break with the arc using an electrode which is especially suitable for arc welding cast iron. This added material when it cools shrinks enough so that the broken sections are pulled securely together assuring perfect alignment of the piece. Figure 1 shows how these tacks were placed in this case.

The next step, after aligning and tacking the piece, is preheating. In a particularly heavy casting and one that has wide variation of cross section, care must be taken to see that preheating is uniform throughout and that one part is not heated more rapidly than another. After studying this phase, it seemed that preheating could be limited to the immediate sections of the break. Accordingly firebrick furnaces were

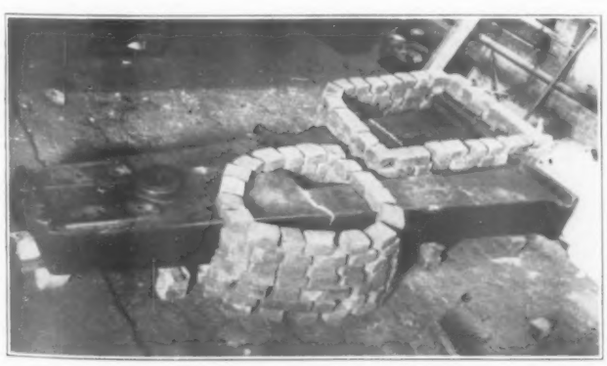


Figure 3. Firebrick Preheating Furnaces Around the Fractures.

built up as shown in Figure 3. To secure a slow even heat a few shovelfuls of charcoal were placed around the bottom of each and ignited. They were left to burn uncovered until the entire section had reached an even temperature. Then enough charcoal was added to bring each part up to a good red heat which is suitable for welding. The total preheating time on this job before welding was started, was six hours.

Common practice in welding heavy castings includes veeing out the break to the bottom. This is done to be sure that the new weld metal gets clear to the bottom. However, Mr. Hettrick finds that this can be eliminated by cutting out with the welding flame after the preheating has been finished. This method has much to favor it. In the first place if the

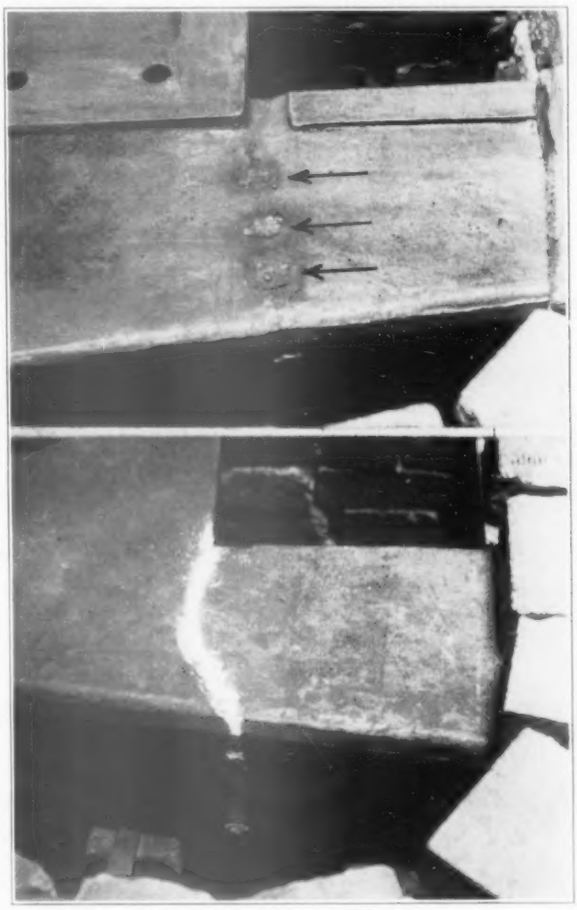


Figure 1. (Above) Arrows Indicate Tack Welds Made with the Arc. Figure 2. (Below) Chalk Mark Indicating the Break.

break is veed out to the bottom, there is only a small section on which to judge alignment, whereas with the entire section to gauge by, the slightest deviation is at once noticeable. In addition to that, cutting out the vee takes considerable time and adds to the cost of the job. Since the part has to be preheated anyway, it is obviously more economical to melt out the metal with the torch after it is heated nearly to the welding temperature. A further point in favor of this procedure is that the vee prepared by melting need not be so wide and when it comes close to the bottom, the parent metal can be puddled down to make the bottom of the weld. Both of these last points reduce cost in that less weld metal is required. One point in this method that must be carefully

watched and that is the veeing out operation. The vee must be melted down to the bottom. With practice the conscientious welder can do it successfully.

The preheating in this case required six hours at which time the break and the surrounding metal was at a bright red heat. Holes were broken in the asbestos paper covering just large enough to permit entering the torch head and welding rod. Two welders worked together one on each break so that the added heat of welding would not tend to throw the piece out of line. Three quarter-inch welding rods were tacked together for adding material. In this way increase in the speed of depositing metal was secured, since the three small rods would melt more rapidly than one large one of comparable cross section. As the weld progressed sufficient flux was added from time to time to work out any slag and the weld metal was well puddled to secure good fusion and a sound deposit.

One reason for casting breaks is a load heavier than the unit is designed to withstand. Another explanation is a casting strain which is not relieved when the casting is poured in the foundry. If an overload is applied sufficient to cause a break, the welder making the repair has little concern other than to build up a weld equal in area to that of the original metal. However, when a casting breaks for no reason that can be ascertained, it is well to use some method of reinforcing the weld so that the break will not recur. It was with this idea in mind that Mr. Hettrick built up reinforcing lugs over each break. These may be seen in Figure 4. The reinforcement was 2 inches high, one 4x 12 inches and the other 5x 14 inches.

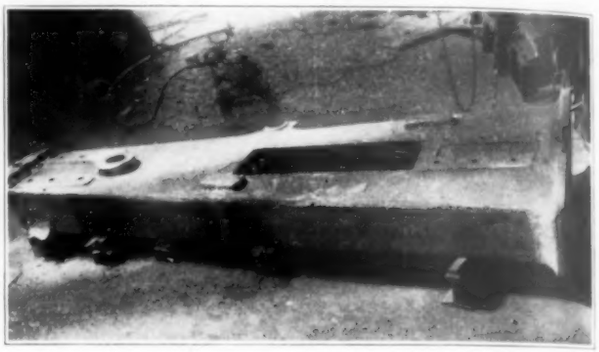


Figure 4. The Completed Job. Note the Builtup Reinforcement.

As was mentioned above two men worked at once while a third alternated with them when the job got too hot. The welding was complted in a total of 5½ hours. To be sure that no strains remained, additional charcoal was added and the welds brought to an even temperature after which they were allowed to cool slowly and not removed until quite cold.

Profitable Job Shop Business Found in Unexpected Places

Profitable contracts for the job welding shop are found in unexpected places. The last place that one might expect to find a good amount of business of a production nature would be a cast iron foundry. Yet a job recently completed by the Western Welding & Boiler Repair Co., 1432 West Lake St., Chicago, Ill., indicates that there are many possibilities there if they only are looked for and the possibilities, once discovered, developed properly.

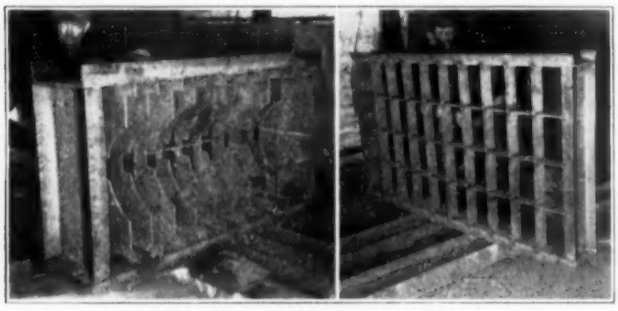


Figure 1. The Welded Foundry Flask. Cope on the Left and Drag on the Right.

J. M. Jardine, proprietor of the Chicago shop, found a foundry that was in need of several foundry flasks. Since this new equipment was comparatively large, he knew that there was an opportunity for selling arc welded steel construction which is considerably lighter than casting of equal size. He had a strong selling point in this lighter construction since handling costs would be reduced; the thin steel sections have more open area in which the sand can be rammed and finally they can be welded cheaper than if made of cast construction. These points all served to convince the foundry and led to their order for 100 complete flasks such as are shown in Figure 1.

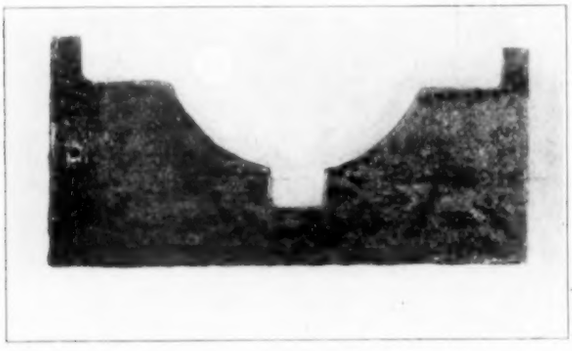


Figure 2. Oxy-Acetylene Machine Cut Plates for Cross Pieces.

Ordinary structural steel shapes and plates were used throughout. Cross sections of the cope were oxy-acetylene machine cut from ¼-in. plate. One of them is shown in Figure 2. For the side pieces channels were cut to proper length and then welded together. Since the cross section units had to be accurately positioned it was found advisable to make up a welded jig for this purpose. This jig is shown in Figure 3. In construction it consists of standard angles and bars. It is shown clamped in position in Figure 3. The cross section plates are then placed in their proper places and welded. The total weight of the cope and drag is only 800 pounds which is considerably less than a casting of comparable size.

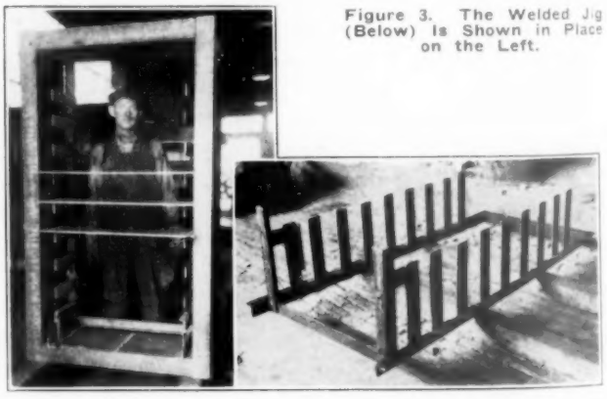


Figure 3. The Welded Jig (Below) Is Shown in Place on the Left.

The wide-awake job shop owner can find many such possibilities for profitable business in his locality if he will but look around a bit and give some thought to the diversified applications of the tools with which he has to work.

Hints for the Welder

WHEN YOU FIND a new way to do a hard job, or finish a particularly interesting weld, can you describe how the work was done? . . . . . Have you learned some little stunt every welder ought to know? . . . . . Write to us about these things . . . . . This department helps you welders to help each other. Write up your ideas any old way and just make rough pencil sketches . . . . We'll fix them up for publication.

Overhead Sludge Hopper Saves Valuable Ground

By Don Llewellyn†

An overhead sludge hopper, designed by the writer, has been in service at the plant of a large steel fabricating firm in this district for about six months and has proven very efficient. This hopper, occupying only 100 sq. ft. of ground space, replaces a two-acre sump hole, which valuable land has been reclaimed and a magnificent shop erected on it.

Figure 1.

Figure 2.

Figure 3.

Figs. 1 and 2 show front and corner views of hopper which is constructed of ¼-in. plate and is ten feet square and six feet deep, with sloping bottom. This supporting frame consists of angles, braces and gusset plates of ample strength for the load. Both hopper and frame are welded throughout. A twelve-inch square opening in bottom is fitted with a gate valve for dumping sludge. Clearance under the hopper is ample for a dump truck body and also permits inserting a hoe from underneath when the sludge sticks.

In operating this hopper, sludge is discharged from the generators into a pit and while still in solution with water it is pumped into the hopper at the top. The two-inch centrifugal sludge pump, driven by 1 H.P. electric motor, is illustrated in Fig. 3. The motor has automatic start and stop float operated control, located in the pit at the generators. After three hours in the hopper, hydrated lime settles to the bottom and water is drained off into a sewer or used again in generators. The cost of this overhead hopper was approximately $300.

†*Supervisor, Air Reduction Sales Co., Los Angeles District.*

How to Re-Bronze Worn Bearings

By Paul Ross

Almost every one is familiar with driving wheel lathes and the punishment which the bearings receive. All driving wheel tires are of very high carbon steel and most of them have hard spots caused from sliding of the wheels. These hard spots cause jerks and chatter which react on the bearings.

These lathes come equipped with the conventional bronze bearing liners pinned into the cast iron housing. The severe service to which they are put has a tendency to loosen or break the liner. Some 12 years ago a Western railroad was confronted with this problem. Their welder suggested that the bearing housing be "tinned" with bronze and a bearing built in place which could be bored to size afterward. This was done and it was so satisfactory that when the bearings had worn enough to require it, the operation was repeated. Of course the cast iron did not need tinning. All that was necessary was the deposition of enough Tobin bronze to enable the bearing to be rebored. The four main bearings and two back gear shaft bearings were so treated. About 100 pounds of Tobin bronze was used and the job was done in two days. The Tobin bronze probably makes a better bearing metal than the casting bronze which is usually used for bearings.

Glowing Electrode Tip Is Not a Cigar Lighter

C. J. Holslag of the Electric Arc Cutting & Welding Co., Newark, N. J., writes in to remind us that it is bad practice for a welder to light his cigarette or cigar from the glowing end of an electrode while it is still in the electrode holder. This is a handy trick when matches are deep in an inconvenient pocket, but a damp cigarette and damp shoes offer a sufficiently good conductor to give the operator a shock with a kick like a mule. Such a shock may easily prove fatal particularly when working on a high scaffold, in a tank or some other place where being thrown off balance can result in a serious fall.

Many people believe that it is the electric shock itself that "throws one," but in reality it is the struggle against the muscular tension resulting from the shock that causes the victim to be thrown violently off balance. The release of this tension, particularly in high places can too often prove fatal, even if the shock itself is nothing more than an unpleasant "jolt." Either one can be safely circumvented by observing the common sense safety rule of never lighting a smoke from a glowing electrode tip when it is still in the holder. Digging out a match takes a little longer, but the operator knows that he will be able to keep on lighting them for a long time to come.

Oxy-Acetylene Branding With Stencil

By H. B. Van Fossen†

Many Utility and Contracting Companies employing work crews and pipe or cable gangs, brand their ladders, tool boxes, etc. with name or numerals for identification. This is usually done with old fashioned branding irons which are sometimes quite heavy and require considerable heating in a forge or

†*Serviceman, Air Reduction Sales Company, Philadelphia District.*

furnace. Other disadvantages are that when too hot, the irons tend to char the entire surface of the wood, and as they do not retain the heat for a very long period, they must be frequently re-heated.

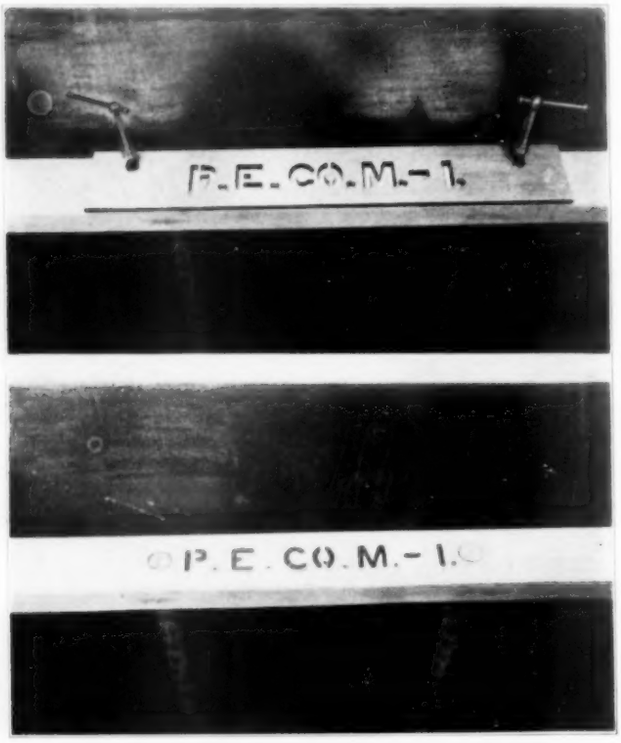


Fig. 1. (Top) Shows Stencil in Position. Fig. 2. (Below) Shows Brand Made with Flame.

The method illustrated calls for the use of a stencil (shown in Fig. 1), through which the flame of the oxy-acetylene welding torch is directed much as a stencil brush would be used. The stencil can easily be made in the average shop and should be of ¼" flat, cold rolled steel with the letters or numerals laid out, drilled, or cut with torch and filed with a slight taper or bevel from the top. The thickness of the steel helps to keep the stencil rigid and absorbs the heat, while the bevel on the letters directs the flame more effectively. The best results will be obtained if the stencil is clamped in place and an extremely small neutral flame used. A little experimenting will enable the operator to determine the desired depth of the letters. The stenciling should be done on a clean wood surface and the charred letters brushed out with a stiff bristle brush after the stencil has been removed. Paint, varnish or linseed oil may be applied after stenciling.

The work can be accomplished in a fraction of the time required with the old method and with a consequent saving in cost. The result is a clear cut, easily read brand as illustrated in Fig. 2.

Hole Piercing Started With the Arc

By Paul Ross

In any shop where plates or structural shapes are marked from templates, a hole will be missed occasionally. These are usually discovered on the assembly floor and the cheapest way to correct this error is by "burning through" with a cutting torch and finishing with a reamer.

It is rather difficult to start a cut in the bottom of a bolt hole and I sometimes wonder how many tips have been ruined and how much profanity expended in trying to do so. Recently the writer was called on to cut a 13/16-in. hole through a ⅝-in. plate tightly clamped between two 4x4x⅝-in. angles. This was an aggravated case in as much as we could not preheat from the back as is our usual practice. A nearby arc welder was called to help. By striking an arc in the bottom of the hole on one side and holding for it few seconds the plate was brought to a red heat so that piercing was accomplished from the opposite side before the torch tip was heated to any extent. A metallic arc was used but that did not matter as the deposited metal was cut out along with the plate material.

Building a Job Welding Business

By W. Irving Brockson

VIII—Making Personal Calls

SELLING is the weakest operation in the average business. Manufacturing and production procedures, in general, are far better organized and conducted more scientifically than selling. This holds true in the job welding business, because the average shop is far better organized to turn out good welding jobs than it is to get the work into the house.

For this very reason, it is highly important that the shop which hopes to stay in business and grow give attention to selling—that is, getting more business from old customers and securing new ones. It is possible for a shop to go along for months and perhaps years, simply taking the business that comes to it, making no effort either through advertising or personal selling to get new customers. But such a plan is dangerous and sooner or later leads to ruin.

In this discussion it is assumed that most of the personal selling done for the job shop will be done by the owner. Few shops are large enough to maintain a force of salesmen, and besides, good welders can be hired for less money than good salesmen. Consequently, as a welding business grows, it is usually better for the owner to employ help in the shop rather than to employ salesmen.

Locating Your Prospect. At this point it is assumed that the reader has seen the installments in this series dealing with direct mail advertising, telephone directory advertising, signs, and telephone selling. It is furthermore assumed that the job welder will want to work along some of the lines mentioned in these articles and will have accumulated either a small or large list of prospects—firms that should require his services.

Study the Prospect Before You Call. With such a list of prospects before you it is essential that you study each one individually before you make a personal call—that you, like a general before a battle, get all the facts you can before you prepare your plan of attack. This will consist of a knowledge of the product which the firm makes, their general plan of manufacture, their present use of welding, the names of the superintendent, the welding foremen and others who may be involved in deciding whether you will get an order.

It is always a good plan to learn as much as you can in advance about the personality of the man in question, kinds

of work they do, their peculiarities, their weaknesses, their hobbies and their prejudices. It may not always be possible to get this but it is far better to have it than not, because it gives you a world of "Ammunition" you would not otherwise have.

Common Sense vs. "Bunk" in Selling

Whole libraries have been written on successful personal selling. Some of the material is most excellent whereas some is "bunk." Consequently, in a brief outline articles of this nature it is possible to touch only the "high spots."

Resultful selling is being accomplished by such varied types of people and in such a multitude of ways that hard and fast rules are dangerous to attempt. The suggestions made below, have been culled from a great mass of experience, both personal and recorded, and have been subjected to the test of "Horse sense." If you don't agree with any one of the suggestions, go out and do the opposite or disregard it, if you wish. If you sell successfully, you will have demonstrated to your own satisfaction that the author's ideas may be wrong. But you will at least have done a lot of thinking about methods of selling, and if this article can stimulate you to give some real thought to your selling technique and your selling plan it will have accomplished its purpose. If your way doesn't work "we win the bologna."

Dress and Appearance. You will be more of a success if you go out to sell "dolled up a bit," cleanly shaven in your "Sunday-go-to-church" suit than in your shop outfit. To this suggestion you may say, "H——, I'm a welder and I'm going out to see shop men who are dirty from teeth to toes. If I'm dressed up these fellows will 'laugh up their sleeve' at me and have no confidence in me."

This may be true in some cases, but let's look at the thing further. In the first place, in calling on any firms except the smallest ones, you usually can't get to see your shop man without going in through the purchasing or some other office department. At this initial point, you are being judged on the basis of a salesman and not on the basis of a welder. You are being sized up and compared with other salesmen. Unless you have a definite appointment, some clerk or assistant purchasing agent may talk to you and if you do not make a favorable impression he may block you from getting into the plant.

At any rate, first impressions are important and good clothes combined with neatness and cleanliness of person tend to impress others with your success as well as to create confidence in yourself.

Your Speaking. Good selling presupposes a reasonable degree of proficiency in the everyday art of talking. The man who stutters, "hems and haws," or has to think an hour before he can reply to a question or has some mannerism which other people dislike will have "tough sledding" trying to sell. The salesman is called upon to take the initiative during the interview and must develop the knack of "keeping the conversation going." Even though he is not required to be a professor of English, he should be able to communicate his thoughts clearly and convincingly to the other fellow without calling attention to his method of speaking or the mechanics of his speech.

Value of Self Confidence. You must have confidence in yourself and in what you are selling before the buyer can be convinced that he should pay his hard earned money for what you offer. A timid, apologetic manner, is a terrible handicap. Even though you are somewhat backward at first about making calls, remember you are going out to perform a service for your prospects, to offer them a welding service which has real value to them and on which they can make a profit. If you are not convinced of that fact yourself you should never go out to solicit business.

Avoid Boasting and Arguments

It is going to the opposite extreme to be boastful, and argumentative. The man who is cocky, arrogant and continually bragging soon becomes disliked, and the salesman who displays these characteristics is doomed to failure. A salesman should be able to get people to like him and glad to see him. Some times we hear the question "what are the sales arguments in favor of this proposition?" The word "arguments" is misplaced here because selling is not arguing. Although you may be called upon to present your story and to answer objections with vigor and enthusiasm you can and should do it tactfully, "with a smile," and without arousing the buyer's ill will.

The YOU Attitude in Selling. Your thinking and speaking when in the presence of a customer should be in terms of "You" rather than "I"—the customer rather than your own interests. It goes without saying that no man will give you a welding job until he is convinced he will gain something by it. Consequently your surest and quickest way to an order is to show an understanding of his problems, and to point out ways for him to make a saving or a profit. You are to be of service to him and you should remember the slogan of Rotary "He profits most who serves best."

Sizing Up Your Prospect. During the first few minutes of your interview, it is well to try to "size up" your prospect to determine what sort of tactics will be best suited to him. A little practice will soon tell you which men are likely to be jovial, which serious minded and which "hard boiled." If you can learn to be an accurate judge of personality and character you have taken a long step towards successful selling.

Inquire First. The desirability of getting as much information about a company and a man prior to making a call has already been mentioned. However, it is never possible to get complete information in advance. As a result, it is well to find out in the early part of the conversation just how "the land lies." Namely, what are his principal mechanical operations, does he have his own welding equipment, what are his principal welding needs likely to be. With this information you can adapt your conversation to points that will be of immediate interest to him. You will not be "going off at a tangent" or talking to a "deaf ear." You can point out just where your work will fit in with his to his advantage.

The Need to Be Alive. "Nothing worth while was ever accomplished without enthusiasm," goes an old truism. And enthusiasm is contagious. If you are alive, on the job and "full of pep"—tempering it all with sound business judgment—you are far more likely to convince your prospect, superintendent or foreman than if you are half asleep in your manner, listless and afflicted with "that tired feeling."

Be a Good Listener

The salesman should not try to do all the talking. One very prominent authority on selling makes the statement that although one must be a good talker to sell, it is essential that he be a good listener first and a good talker second. By allowing the other man to talk you let him get a great deal "off his chest" and you thereby get a lot of information which you can turn to your own account either in the current interview or later. Furthermore, we all like to talk about the things that interest us and we all think more highly of the man who listens to us sympathetically and understandingly than the one who continually interrupts and shows impatience with our story.

Don't Stay Too Long. You may be getting along famously with your prospect but it is dangerous to drag out the interview. Your prospect has other things to do besides talk to "peddlers," and even though he may be polite and affable in manner he may be figuratively "burning up inside" to get rid of you. So, BE BRIEF. And after you have done justice to your cause, presented your proposition fairly—whether you have landed an order or not—the safe thing to

(Continued on page 60)

Claims America Leads In Structural Welding

In the course of two recent visits to Europe, Francis W. Wilson of the Wilson Engineering Corp., Cambridge, Mass., had occasion to make a close-up study of progress made in arc welding structural steel in European countries. He was particularly interested in this subject because at that time his organization was completing the production of a course of study and training in the design of arc welded steel structures.

"Although arc welding for structural steel is making some progress in the principal European countries," says Mr. Wilson, "yet this development does not compare with the advances made in the United States. The great progress made in America in developing arc welding for structural steel has attracted the attention of foreign engineers to such an extent that although we have not advertised our new course in foreign countries, yet we have received a number of enrollments from engineers in various parts of the world. They welcome the opportunity to obtain thorough training in the American methods of designing work of this type. You may be interested to know that students in Australia and Peru have written us regarding the very considerable amount of arc welded structural steel work being constructed in their vicinity."

The course of study referred to is intended primarily for men of mature age with a background consisting of a course in an engineering college supplemented by more or less actual experience; men for whom it is out of the question to abandon their employment and devote time to taking up such a study in a local class. Such men are accustomed to reasoning and thinking for themselves and, therefore, find that correspondence instruction is highly efficient for their purposes. In the preparation of the course, The Wilson organization has had cooperation of a number of the best authorities on arc welded structural steel in the United States. Three years were spent in preparing it and although enrollments started only a few months ago Mr. Wilson states that the demand is really encouraging because the number of enrollments is constantly increasing.

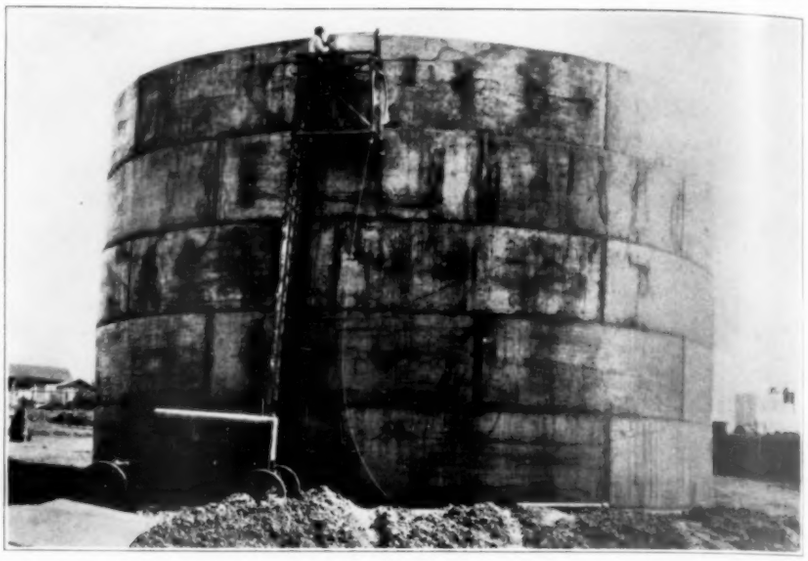
Reports Good Business in 1931

That new welding products are of interest to buyers of industrial equipment even in dull periods of economic activity is evidenced in a recent communication from the Warner Engineering Corp., Pomona, Calif. It is but little over a year ago that the Warner Electric Flame Welder was placed on the market and sales efforts begun. In the face of badly depressed business conditions sales over the past 12 months total a very satisfactory figure.

Mr. Warner says in part, "We are daily receiving inquiries from all over the world. The character of these inquiries today is considerably different than they were a year ago. Gradually there has come a change from idle curiosity to truly interested and business-like inquiries."

The Warner Co. has also developed an alternating current arc welder, which is claimed to have absolute primary and secondary voltage control and secondary amperage control. In addition to the above products, the Warner people market Krom-Aloy welding rods through Union Hardware & Metal Co., Los Angeles, Calif., Joseph T. Ryerson & Son, Inc., Chicago, Detroit and Cleveland; Fuller Supply Co., Utica, N. Y.; Deckop Bros. and Bannar Welding Supply, Buffalo, N. Y.; New York Welding Supply Co., New York City and Albany Calcium Light Co., Albany, N. Y.

20,000 Barrel Arc Welded Storage Tank at Corpus Christi, Texas



This huge storage tank has just been completed at Corpus Christi, Texas, and is designed to hold 20,000 barrels. It was erected without a single bolt or rivet and was completely arc welded by Lincoln welding methods. Some idea of the size of this tank can be gained by noting that it has five courses in the shell. A novel erection feature is the traveling scaffold on which the welder is to be seen working. It is hung from the top of each course after it has been tacked in place and greatly facilitates the erection work.

"Oxy-Acetylene Welding and Cutting" in Second Edition

"Oxy-Acetylene Welding and Cutting," A Course of Instruction, by Stuart Plumley is now in its second edition. The new book has been revised and enlarged by 100 additional pages and 93 new illustrations covering fundamentals of oxy-acetylene welding and a wide variety of its applications. The text is arranged as a series of twenty lessons, each of which is followed by a job sheet which includes a series of exercises and questions by which the reader can test his knowledge of the material just covered. A second section of the book includes chapters on boiler welding laws, A. S. M. E. Boiler Construction Code, Boiler Code for Heating Boilers, Firebox Welding Practice, Hard Alloy Overlays, etc. An advertising section includes a listing of representative welding accessories.

The author has been engaged in engineering practice since he left school in 1898, twenty-two years of which have been in the field of oxy-acetylene welding. This wealth of experience makes him well fitted to handle the assembling of so complete a book as his "Oxy-Acetylene Welding and Cutting." The new edition has 410 pages, 7¾x11 inches with 568 illustrations. The price is $5.00 per copy postpaid, and the book may be obtained from *The Welding Engineer*.

Gas Welding Demonstrations at Waukegan Welding Club

Despite particularly inclement weather the November 20th meeting of the Waukegan Welding Club held in the Aviation Mechanics Building, Naval Training Station, Great Lakes, Ill., was especially well attended. The meeting was opened by Lieutenant-Commander Gearing who welcomed the Club to the station for its regular session. Mr. Gearing pointed out to those in attendance the close connection between the Navy and American industry, mentioning one instance in the past when a steel order for naval vessels furnished considerable impetus to the steel industry. The part that welding plays in the activities of the naval station was also brought out strongly in Mr. Gearing's timely presentation.

The balance of the meeting was in charge of the Torchweld Equipment Co., Chicago. The formal program was started off by W. A. Slack, president, who pointed out the wide field for the application of welding in modern industrial fabrication and the opportunities that await the man who is trained to handle them. Two short talks were presented by J. L. Jensen and R. C. Gutke whose subjects were "Why the Neutral Flame" and "Regulators," both of which

covered fundamental aspects of oxy-acetylene welding and the apparatus used.

Several interesting demonstrations followed, which included welding of Nichrome; brazing with phosphor bronze; brazing extruded brass; cutting and brazing with city gas; cutting with the gasoline torch; oxy-acetylene machine cutting and welding.

More than 50 members and guests who were present remained long after the demonstrations were finished to ask for further information and discuss the operations they had seen. In addition to those mentioned, C. H. Williams and Mr. Reineke were on hand to answer all questions.

Machinery and Welder Corp. Organized in Chicago

Announcement has just been received that the Machinery and Welder Corp., has been organized in Chicago, Ill., with offices at 2604 N. Cicero Avenue. The new organization will handle the distribution of General Electric arc welding equipment and accessories in the Chicago territory and in addition will maintain a service shop for repair and servicing of all types of arc welding equipment. A further feature will be a rental service as well as sale of used, rebuilt and new machines.

F. P. Kohlbry is president of the new organization. He was formerly with Halpin-Kohlbry, Inc., St. Louis, where he gained wide experience in arc welding sales and service. Included also in sales engineering are H. C. Kelsey, formerly sales manager, Joseph T. Ryerson machinery sales in Buffalo; R. B. Rogers, in the past an instructor in arc welding in the General Electric Co. School in Schenectady and J. C. Keene who will represent the company on railroad sales.
neer.

Over 900 in Attendance at Minneapolis Conference

Exceptional interest in the subject of welding was evidenced at the Conference on Welding Methods held in the plant of the Caterpillar Tractor Co., Minneapolis, Minn., Nov. 19-21, under the direction of the Northwest Chapter, American Society for Steel Treating and the Manufacturers' Association of Minneapolis, Inc. Over 900 registered for the meeting which opened with two papers on Thursday night. The first of these was presented by Stuart Plumley, Smith Welding Equipment Corp., Minneapolis, on the subject "New Code for Welded Pressure Vessels." He was followed by F. G. Outcalt, Linde Air Products Co., Chicago, who discussed the important subject, "Testing of Welds."

The Friday morning session was opened with another paper by Stuart Plumley who spoke on "Hard Surfacing." He was followed by H. J. Bartlett, Crane Co., Chicago, who spoke on "The Use of Welding in the Piping Industry." In the afternoon the first paper was presented by W. M. B. Brady, General Electric Co., Chicago, whose subject was "Automatic Welding." "Recent Developments in the Welding Industry and the Opportunities They Present to Trained Operators" was the presentation of L. C. Monroe of *The Welding Engineer*. During the evening two subjects were discussed, the first by G. O. Forseth, Dist. Mgr., Lincoln Electric Co., Minneapolis, on "The Shielded Arc, Both Manual and Automatic." He was followed by A. F. Huna, Applied Engineering Dept., Air Reduction Sales Co., who gave some timely information on "Bronze Welding and Cutting."

"Shop Welding of Machinery" was the Saturday morning presentation of W. W. Reddie, Mgr. Welding Section, Westinghouse Elect. & Mfg. Co. In the afternoon F. G. Outcalt presented a paper, "Lindewelding—a New Technique of Pipe Welding." All of the prepared papers aroused lively discussion, which indicates the ever increasing interest that manufacturers are taking in the application of welding to the fabrication of metal products.

In addition to the papers presented there were many demonstrations of welding practice, which included bronze welding of cast and malleable iron; aluminum and chrome-alloy welding; pipe welding; welding of non-ferrous metals; hard surfacing; oxy-acetylene cutting by machine and the oxygen lance and reclamation of defective castings. Manufacturers of welding equipment and accessories were also present with displays of their products and latest developments.

Large Welded Bubble Tower for High Temperatures

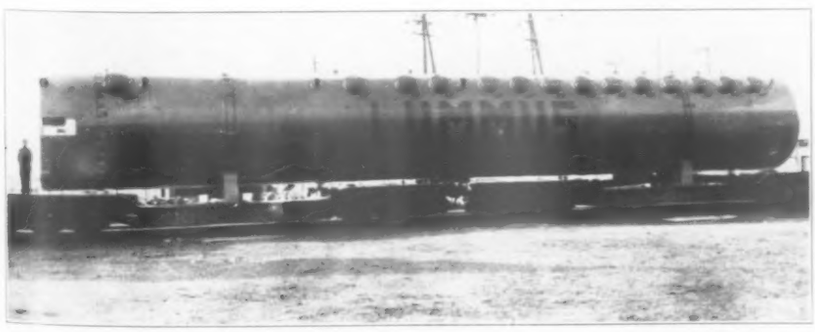
A bubble tower or fractionating column 12 ft. in diameter and over 93 ft. long was recently constructed by The Babcock & Wilcox Company for the Lummus Company. This unit is to be erected in the Bayonne, New Jersey, refinery of the Tidewater Oil Company and will be used in producing high quality gasoline of the modern anti-knock quality. The bubble tower receives mixed vapors and liquids, separating the gasoline by fractionation.

To meet the demands of this process the tower is built to withstand a pressure of 150 lbs. per square inch and temperature of 700 degrees Fahrenheit. It weighs over 325,000 pounds.

All the joints and seams of this tower were made by the B. & W. fusion welding process, using General Electric arc welding equipment, and to check the perfection of the welds photographs of the seams were made with a powerful X-ray machine employing tubes actuated by 230,000 volts.

After the welding was completed the tower was placed in a furnace and given a strain relieving heat treatment of several hours at approximately 1200 degrees Fahrenheit.

It was shipped in one piece on special cars over the Erie R. R. from Barberton, Ohio, a distance of about 600 miles. The length of the haul combined with the size and weight of the tower make this one of the unique shipments in the history of railroading.



This 325,000 Pound Fractionating Column for the Lummus Refinery Is Welded to Withstand Pressures of 150 Pounds Pressure and 700 Degrees Temperature.

Steel Constructors Plan Further Welding Research

The Executive Director of the American Institute of Steel Construction in his meeting with the Board of Directors of that organization on November 20 pointed out that research activities of direct value to the public had proven highly beneficial to the steel construction industry. It was with this idea in mind that recommendations for activities of the Institute during the coming year were made along broader lines. Among other items in a comprehensive and widely varied program, there is a subdivision dealing with welding. This will cover the development of additional data relative to the use of welding as the process is applied to the work of the Institute members.

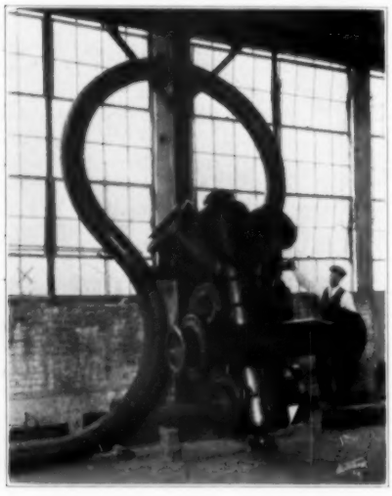
Welding to Be Featured at A.S.S.T. Section Meetings

Several local chapters of The American Society for Steel Treating have meetings scheduled at which welding subjects will be presented in the form of prepared papers. Among these the first is the January 8 meeting of the Toronto, Ontario, Chapter, which will be followed by the January 18th session of the Springfield, Mass., group, which will be in charge of J. R. Dawson. On March 1 the Tri-City Chapter will meet to hear a discussion on Welding and

Cutting and Elkonite and Carboloy, which will be led by G. N. Sieger. Another welding meeting will be held by the Cincinnati Chapter on May 5.

High Pressure Steam Header Is of Welded Fabrication

An unusually large and interesting job of welding was recently turned out by the Midwest Piping & Supply Company, Inc., of Los Angeles, Calif. The job which was handled by the company's shop in Los Angeles for the Pasadena Municipal Light & Power Company,



High Pressure Steam Header Welded by Midwest.

comprised the fabrication of a high pressure steam header. A view of the job as it appeared on completion is shown.

The barrel for this header was made of 24-inch O. D. hammer welded pipe with 1¼-inch walls. The ends of the header were swedged down, and forged steel nozzles were welded in. Four extra-heavy seamless flanged nozzles ten inches in diameter were welded on the side of the barrel, together with one 14-inch and one 16-inch extra heavy seamless nozzle near the end of the header.

A 14-inch cross connection on the top was welded, being of extra heavy seamless tubing with one end swedged to ten inches.

On account of the fact that all of the side nozzles came off at a special angle, it required great care and accuracy on the part of the welders in locating the necks. This was a very painstaking piece of work.

The welding process used in welding the nozzles was oxy-acetylene, while the reinforced gussets and base plates were welded by the electric arc. All flanges were 600-pound Midwest Globack Sarlun Type. The header was annealed after welding, and the final pressure test was made at 1500 pounds hydrostatic.

Los Angeles Section A.W.S. Has Varied Program

The November meeting of the Los Angeles section of the American Welding Society was held at the Pig'n Whistle Cafe on Thursday evening, November 19th.

A paper by Mr. E. J. Cipperly on the subject of "Some New Developments in the Arc Welding Industry," was read and followed by a general discussion by those present.

James Spade, of the Ludlum Steel Company, gave an interesting talk on problems of welding stainless steel, which was followed by a reel of motion pictures by Mr. Etter, of the Air Reduction Sales Co., which illustrated the manufacture of common gases.

Georgia Tech. Plans Conference for January

Word has just been received from the Mechanical Engineering Department of the Georgia School of Technology, Atlanta, Ga., that plans are now being made to hold another welding conference during the latter part of January, 1932. The tentative dates have been set for the 27th and 28th. Details of the papers to be presented as well as the actual dates of the meeting will appear in a future issue of *The Welding Engineer*.

Conference on Metals and Alloys Held at Case

Over four hundred executives and engineers listened in rapt attention while some of the most eminent metallurgists of the country held an enlightening and sometimes heated discussion on metals and alloys at the first of a series of three industrial conferences scheduled at the Case School of Applied Science. The meeting was jointly sponsored by the Cleveland Engineering Society and Case College, on the latter's campus, November 18, 19 and 20. The

Fred L. Plummer.

attendance included 186 members of the Case faculty and student body and 296 engineers and executives.

According to Professor Fred L. Plummer, chairman of the conference, the three-day meeting was one of the most successful ever held on the Case campus, not only from the standpoint of the interest evidenced by the attendance but also as manifested by the high quality of papers given by some of the best authorities in their respective fields.

The opening session was welcomed by Dr. W. E. Wickenden, Case president, who predicted that competition in the future will be between products rather than firms.

"Better and cheaper products will rule the buying market and the firms that leap ahead will be those who have kept abreast of the latest advances in research," Dr. Wickenden said.

Concerning the importance of the Case industrial conference, Dr. Wickenden commented:

"Whenever surgery develops a new technique of removing tonsils or splicing bones, there is always a clinic at hand where the practitioner can spend a few days mastering the latest advance in the art. These intensive clinic schools rank among the most important units in medical education.

"The engineer is not so well provided for as the surgeon. He receives a solid scientific grounding in school, then goes out to master the art of application in practice. If he has an unusually able boss or joins the staff of a large and progressive company he may be as well taught on the practical side as his college has done on the scientific side. In most cases he is left largely to his own devices. Case School of Applied Science and the Cleveland Engineering Society are cooperating in an effort to provide this type of education for pacticing engineers."

Lenney Spot Welder Bulletins Issued in Filing Binders

Lenney Machine & Manufacturing Co., Warren, Ohio, have issued a loose leaf filing binder with bulletins describing their line of spot welders. There are several pages of general information on spot welding and the "Standard" machines of Lenney manufacture. The types of welders described and illustrated range in operation from foot treadle to motor, air operated, and gear box drive. Capacities range up to 33 K.V.A. and material up to $\frac{5}{16}$-in. can be welded in the units shown.

Two New Welding Studies Issued by Lincoln Electric

The Lincoln Electric Co., Cleveland, Ohio, is distributing two additional loose-leaf sheet studies of the application of arc welding. The first is Application Sheet No. 25 in the series on Elements of Design and is a continuation of the Application of Bosses. Various types of bosses are shown and the method of fabricating them by means of arc welding. Plate 29, Studies in Structural Arc Welding is the second sheet and covers the subject of Purlins in Arc-Welded Mill Buildings.

Mon-Arc Bulletins Describe Three Welding Units

Loose leaf bulletins recently issued by The Mon-Arc Welder & Electric Co.,

Cleveland, Ohio, describe three different types of electric welders of their manufacture. A line of all welded steel spot welders is shown in six sizes with a range from 2 to 30 K.W. for welding 20 gauge material up to ⅛ in. In another bulletin the Mon-Arc line of electric arc welders are described. These units are remanufactured according to the design of the Mon-Arc people. They are made in 200 and 300 ampere capacities and in four styles of portable mountings. A new item in the line is listed as the Flaming Arc Welder, which operates on the two carbon arc principle. Power is developed by plugging into a light socket. The machine is furnished complete with goggles, battery welding attachment, carbon rods and an assortment of welding rods and flux.

New Rego Catalog Ready for Distribution

The Bastian-Blessing Company, 240 East Ontario Street, Chicago, makers of Rego Welding and Cutting Equipment, announce the completion of a new Catalog No. 57.

The Rego Catalog No. 57 is a pocket size booklet of 40 pages, indexed for ready reference. It lists specifications and prices of all types of welding and cutting torches, regulators, gas economizers, acetylene generators and the various accessories. This little catalog fully describes each piece of equipment and lists its uses. Many helpful hints are included. The chapters on "How to Make Up a Special Outfit," "How to Choose a Torch," are of interest.

Copies of the Rego Catalog No. 57 are available free, on request. Address The Bastian-Blessing Company, at the address given above.

Welded Stainless Tanks For Milk Transportation

A new possibility for metal in the replacement of glass as a material for milk tanks in refrigerated tank cars was illustrated in the National Dairy Show exhibition in Atlantic City, by a milk

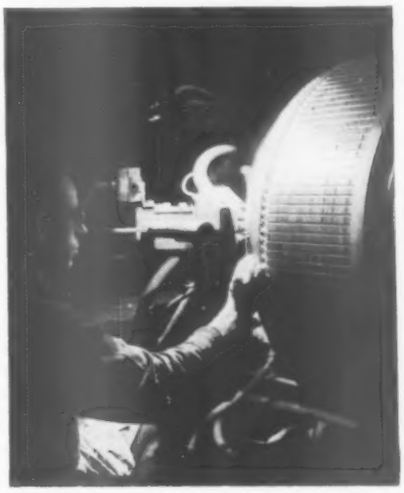
Interior View of Car Showing One End of Welded Tank.

tank car with welded tanks of Allegheny metal, one of the non-corroding chromium-nickel alloys. This car, exhibited by the North American Car Corporation, of Chicago, was built by the Pressed Steel Car Company at McKee's Rocks, Penn., with tanks by the Alloy Products Corporation, of Milwaukee.

The car exhibited at Atlantic City is of the refrigerator type, specially insulated. It contains two seamless tanks of welded Allegheny metal plate, polished on the inside. These tanks are of 4000 gallons capacity each, giving the car a total capacity of 8000 gallons. The same car is also supplied with tanks of 3000 gallon capacity, a total of 6000 gallons for the car. The tanks are insulated with 3 inch corkboard or Thermo insulation and then are enclosed in 3/32 inch tank steel, with all seams welded. They are mounted in cradles attached to the needle beam of the cars, making them an equipped part of the assembly.

Railroad Motor Rotors Brazed for Tight Connections

After the rotor of the railway motor is wound, this electric brazing machine makes connections tight and positive.



Brazing Motor Rotor Connections to Insure Positive Electrical Conductivity.

This machine and two others like it are in the East Pittsburgh Works of the Westinghouse Electric & Manufacturing Company and are used in the production of electric motors for 90 new electric locomotives for the Pennsylvania Railroad.

Stulz-Sickles Announces New Manganese Steel Rods

Stulz-Sickles Co., 134 Lafayette St., Newark, N. J., have recently announced two new managanese steel electrodes which are designated Seaco Manganal 11-13½% manganese steel electrodes, bare and Tite-Kote and Grade No. 151 Manganese alloy Tite-Kote. It is said that more than five years have been spent by this company in experiment and research to find a means of reclaiming manganese steel castings which were broken or worn to the extent that they were about to be scrapped. Manganese castings are subjected to treatment in manufacture to develop certain qualities which are destroyed if subjected to excessive heating such as is common in welding practice. For this reason welding on such material has been accompanied by several difficulties. It is claimed that this new development now makes it possible for any one with the proper arc welding equipment to repair or rebuild items cast of manganese steel.

The particular uses that are noted are building up shovel and dipper teeth, bucket lips, crusher jaws, sprockets, etc. The makers say that reports have been received that show rebuilt units are outwearing the original castings and that reclamation has been carried out at a cost of one-third to one-half the original cost. While original recommendation was for use on manganese steel, some users have had excellent results from welding on overlays to equipment that is subject to abrasion.

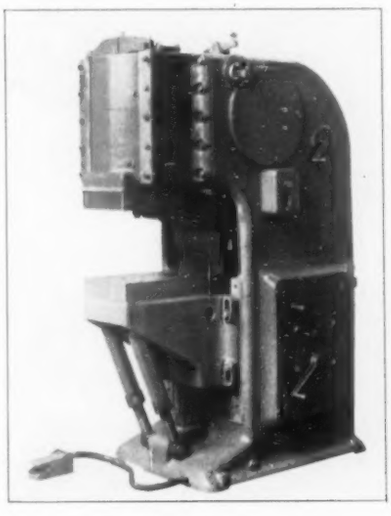
Manganal is offered both bare and Tite-Kote in sizes ranging from ⅛-in. to ¼-in. and 14, 18, 24 and 36-in. lengths or coils. It is recommended that for A.C. current only Tite-Kote be used while either produces satisfactory results with D.C. welders. No. 151 Manganese Alloy Tite-Kote is available in the same diameters and lengths up to 24-inches.

Projection Welder Introduced by Taylor-Winfield

The Taylor-Winfield Corp., Warren, Ohio, has added a newly developed press welder of great sturdiness and accuracy to their present line of welding machines.

This model, shown in the accompanying illustration, is known as the EX-Series embodying several improvements for heavy press welders. It is said to be adaptable to projection welding where it is desired to make a large number of projection welds at one time.

The transformer is of the Pancake design with water-cooled secondaries, so



The New EX-Series Heavy Press Welder.

mounted that inductance losses are reduced to a minimum. The machine will be furnished with transformer capacities of 200 to 450 KVA, and with throat depths of 18 in., 24 in., 30 in. or 36 in.

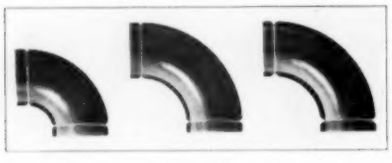
Also, a nine-step self-contained heat regulator is mounted on the side of the machine. Wide terminals are provided with ample space for supporting welding dies.

The mechanical drive of the welder is said to be very simple, with a speed control built into the machine whereby any desired speed from seven to fifty-four strokes per minute may be had. The drive from the motor is taken through an Infinitely Variable Speed Drive, giving a three to one speed variation.

The pressure is applied to the slide by a cam working through a toggle directly in line with the center of the slide. A stroke-changing device is built into the welder so that any length stroke between 1 in. and 2¾ in. may be obtained. It is equipped with flexo-mechanical clutch control, which consists of a foot pedal connected by a flexible cable so that it may be moved around on the floor to the most convenient location for the operator.

Tube-Turns Announce New Short Radius Fitting

Substantially lower prices apply to all Series 1R Tube-Turns, a new series of the seamless, uniform-wall fittings for pipe welding just announced by the manufacturers, Tube-Turns, Incorporated, Louisville, Kentucky.



Cut-Away Sections of Series 1R, 1½R and 1½RX Tube-Turns.

Like all other Tube-Turns, the new Series 1R also has the same outside diameter, the same inside diameter and the same wall thickness and wall tolerance as the pipe with which it is used. This, together with the fact that it is made of the same material, is said to greatly facilitate lining up and welding.

The addition of the new Series 1R rounds out and completes the Tube-Turn line, according to the announcement, affording 45° and 90° elbows and 180° return-type fittings for welding in sizes ¾-in. through 20-in. and in virtually all the weights required by modern piping.

Series 1R Tube-Turns are carried in stock by all Tube-Turn distributors. Descriptive literature and prices may be obtained from the manufacturers.

Announce Fire Extinguisher Automatically Operated

Anti-Fire Extinguisher Corp., Emerson Bldg., Alexandria, Va., have recently placed on the market a piece of fire protection equipment which is said to be entirely automatic in detecting the flame, sounding an alarm and extinguishing the fire. The unit is mounted on the wall of any building and plugged into the house lighting current. In the event of a fire which will raise the room temperature, a liquid is released which vaporizes at about 110 degrees F. The resultant gas smothers the flames. At the same time an alarm is sounded either in the building or in the local fire station or both. The unit starts to function when the surrounding temperature reaches 130-140 degrees. The chemical used is one that is recognized as a powerful and effective fire extinguishing agent, and in addition, the operation of the apparatus is not in any way dependent on the clear thinking of any one who happens to be on hand when a fire starts.

Lindewelder Announced for Pipe Line Welding

A newly designed oxy-acetylene welding torch, designated as the Oxweld Type W-21 Lindewelder (Patented), has been introduced by The Linde Air Products Company, 30 East 42nd Street, New York, N. Y. The Lindewelder, together with the new Oxweld No. 24 patented Lindeweld Process welding rod, are for use in welding by the Lindeweld Process, which is almost automatic. It is claimed that welds of high strength and quality are produced at greatly increased speed.

This unit has two flames with a rod holder which feeds the welding rod automatically by gravity. A rod-lifting device controlled by a trigger on the handle permits the operator to raise or lower the welding rod as required in starting and completing the weld, in passing over tack-welds and in changing rod.

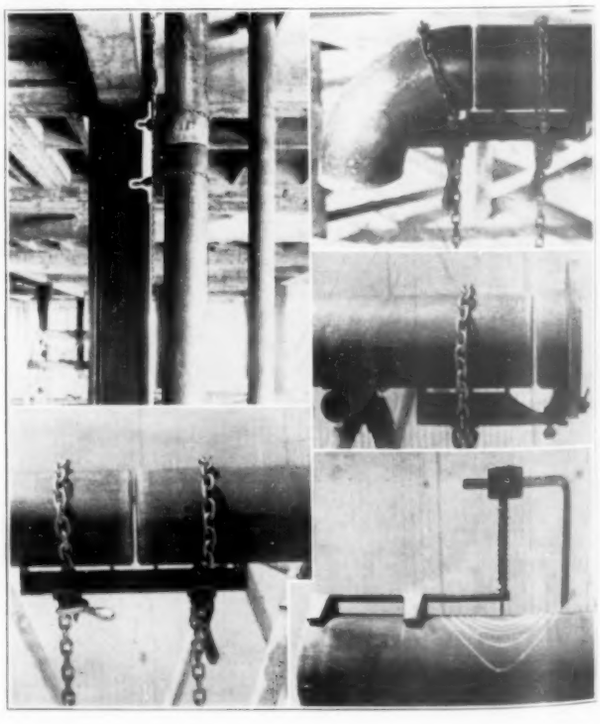
The two flames are utilized, one for

(*Continued to page 55*)

Announce Pipe Tools for Steamfitter-Welder

The Jewel Manufacturing Co., 1874 Otto Ave., St. Paul, Minn., are circularizing the trade with several new items of their manufacture which have been developed particularly for pipe welding. First among these is the Jewel pipe clamp which is used in lining up straight runs of pipe either upright or horizontal. In construction it consists of a beam arrangement with vees in which the ends of the pipe to be welded rest. Chain locks for each section of pipe hold it firmly in place until the tack welds have been made. It is claimed that increased speed can be obtained with this unit. It is available in two sizes: one for pipe from ½ to 8 inches, and the other from 8 to 16 inches. Another item is the Jewel welding flange clamp which holds a welding flange at a perfect right angle to the pipe to which it is to be welded. This unit is also available in the same sizes as the pipe clamp. Two other items of the clamp variety are the Tube-Turn clamp for positioning forged welding ells to the ends of pipe and an angle clamp is available for holding branches to be welded into headers. This unit will position any branch up to 12 inches on a 12-inch header.

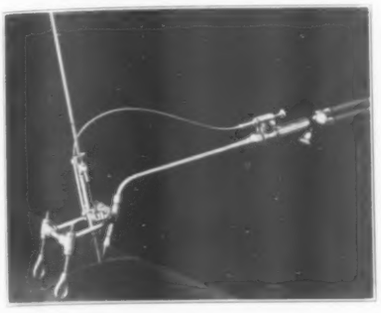
A device which has been developed to eliminate the use of patterns in cutting pipe connections is known as the Jewel pipe marker. This item rests on vee sections on the pipe and a raised marking device is centered over the hole to be cut. A soap stone marker is then in the proper position to mark out the line of cut. It is claimed that perfect holes in the line pipe and ends can be made. Two sizes are available for use on pipe up to 8 inches and up to 20 inches. Prices and full descriptive matter can be obtained from the manufacturers.



(Left, Above) Jewel Pile Clamp Holding Riser in Place for Tack Welding (Below) It Is Shown in Use on Two Horizontal Lengths of Pipe. (Right, Above) The Tube-Turn Clamp. (Center) Jewel Welding Flange Clamp. (Below) A Few of the Patterns That Can Be Cut with the Jewel Pipe Marker.

preheating the welding rod and one for performing the actual welding operation. The upper or preheating flame is so adjusted that the inner cone impinges directly on the rod as it emerges from the lower end of the rod holder, preheating it nearly to the melting point. The lower flame is the welding flame, which is directed between the vee and the rod so that it prepares the base metal for proper fusion with the weld metal and simultaneously melts the end of the preheated welding rod in the welding puddle.

Five sizes of welding tips and five sizes of preheating tips are available.



Application of the Lindewelder Torch in Making a Pipe Weld.

Interchangeable welding rod holders are furnished in three sizes, for ¼ in., ⅜ in., and ⅜ in. welding rod. The change from one size rod holder to another can be made quickly and easily.

In operating position, the Lindewelder is supported by the carriage with the runners straddling the weld directly behind the welding puddle. The runners can be adjusted in length and angle, making it possible to maintain the proper position for all types of work. The position of the rod is such that it shields the flame from blowing backwards onto the molten puddle, thus permitting the weld to solidify rapidly, giving greater speed and uniformly producing a typical machine-made joint of proper dimension and shape.

Whelite Products Have Wide Range of Uses

Whelite Products, which are being marketed by Whelite Distributors, 1737 E. Seventh St., Los Angeles, Calif., are the result of years of research and experiment by George Wheeler, who was for over fifty years a teacher and demonstrator of heat control over the physical structure of steel and iron.

L-Whelite is a blend of mineral powder for toughening and improving the physical structure of steel. When applied to steel under proper heat it is said to penetrate and increase the tensile strength.

Whelite Hardening Powder is a combination of mineral powders which, when applied to steel under correct heat, penetrates very slightly, causes a hard surface, resists oxidization, and can be polished to a fine bright finish. Is non-poisonous and can be used in forge or oven.

Whelite-77 is a hard facing rod. When applied under proper welding heat it is claimed that it will penetrate into the structure of the base metal. It can be quenched in cold water, will not crack easily or chip off and can be forged if necessary.

Whelite Welding Compound is a mineral composition flux for general welding on cast-iron and galvanized metals. It is especially recommended for hard surfacing.

Whelite-XXX is a mineral flux for welding copper and brass to steel, cast-iron or galvanized iron. It is described as a de-oxidizer, refining the metal being applied and causing a strong union. It can be moistened and made into a paste without injury, does not deteriorate by exposure.

Whelite Aluminum Welding Flux is made of carefully selected minerals in composition. The makers claim that it flows immediately and freely, brings the impurities of the metals to the surface quickly, and thoroughly. It can be used as a paste if desired and will not deteriorate under exposure to air.

Federal Welders Made Lighter by Welded Construction

The Federal Machine & Welder Co., Warren, Ohio, manufacturers of electric spot welders, are emphasizing the arc welded construction that is now being used in large measure in the fabrication of their machines. A recent bulletin points out that the "Joule" and Federal Senior Nos. 1, 2 and 3 spot and projection welders are almost entirely made of structural steel welded throughout. They find that many of the graceful lines and flowing contours of the old style cast iron machines have still been retained, yet the welded units have been made with a saving in weight up to 1500 lbs. without sacrificing strength or reliability. Important results of this change are saving in cost of shipping and location on factory floors which could not safely accommodate the heavier units.

Welded Federal Machines Are Lighter.

New "Sil-Fos" Brazing Alloy Patented

The unique brazing qualities of "Sil-Fos," a new low melting point alloy recently developed by Handy & Harman of 57 William St., New York, have been recognized by the granting of U. S. Patent No. 1,829,903. "Sil-Fos" is recommended by the manufacturers for use on copper, brass, bronze, nickel, nickel-silver, extruded brass and bronze, monel metal and other non-ferrous metals and alloys fusing above 1300° F. It contains a sufficient percentage of silver to give it easy flowing, penetrating and alloying properties. Joints are described as strong, sound, ductile and corrosion-resisting. Tests on copper lap joints are reported as showing tensile strength varying from 30,000 to 35,000 lbs. per sq. in.

The phosphorus in "Sil-Fos" acts as a deoxidizer, requiring but little flux and in some cases—mainly in joining copper—no flux at all. This avoids considerable cleaning and tends to insure better results in the hands of the average workman. The melting point is given as 1300° F., which is even lower than silver solders containing less than 50% silver.

Syntron Company Announces New Electric Hammer

The Syntron Company of Pittsburgh designed and introduced on the market recently a new small electric hammer for chipping and dressing metal preparatory to welding.

(Above) The Syntron Electric Chipping Hammer. (Below) A Workman Using a Syntron Unit.

The hammer is very simple in design, consisting of two magnets wound around a hollow barrel with a free moving piston, striking directly on the shank of the chipping tool being used. There are no motors in the hammer, nor gears, bearings, connecting rods, anvils, etc., to require lubrication or to wear and cause trouble.

The hammer weighs but sixteen pounds, is easily handled, and operates from 110-volt, 60-cycle alternating current.

The Syntron Company has just published a new portable electric tool catalog that includes complete descriptive information on this particular model as well as other portable electric tools of

their manufacture and they will be glad to supply one of these upon request.

This new hammer is built to improve the quality of welding work, because if the metals were properly cleaned and all cracks eliminated a perfect weld is not difficult to obtain.

New Soldering Material Has Many Uses

Allied Research Laboratories, Glendale, Calif., have recently developed a new all metal solder which is said to make repairs to aluminum, pot metal, die castings, cast iron and steel quickly and economically. It has been given the trade name Alumaweld and the manufacturers say that it develops a tensile strength of 12,000 lbs. It is applied with an ordinary soldering iron or blow torch and when applied breaks down the structure of the parent metal and makes a fused one-piece joint.

Making a Repair with Alumaweld.

This new material melts at a low temperature, but after application the makers find that a temperature of 50 to 250 degrees higher is necessary to remelt it. Instances have been noted where successful repairs have been made to steam and water equipment, motor cylinders and crank cases and similar uses. It can be polished and will take a plating of chromium or other material.

News of the Industry

Paul Whitehead, who owns and operates a machine and welding shop at 1525 Harbor St., San Diego, Calif., is building an additional room to his shop to be used as a pattern designing room. Mr. Whitehead, in addition to handling general welding work, specializes in patents, models, and designing. He has been in his present location for over 15 years and operates his shop under the name of "Metal Crafts."

The Emerson-Crowson Welding Works, of Los Angeles, Calif., recently moved locations from 205 E. 37th street to 205 East 38th street. The new location is in the rear of the plant of the Fernholtz Machinery Company. General gas and electric welding of all kinds is featured by the partners of this concern which has been operating in the industrial district of Los Angeles for the past several years. A new 200-amp. Lincoln electric welder was recently added to the shop equipment.

Preparations for the Third Annual Oil Equipment and Engineering Exposition, which will be held in Los Angeles, Calif., from February 1 to 7, 1932, are already well under way. Several new features are scheduled to add value to the show. Two steel derricks are in place on the grounds at 131st and Alameda Boulevard, and are a part of the permanent display as well as the annual exposition.

Manufacturers and distributors of welding units, accessories and supplies have reserved booths and additional space for demonstrating methods and recent developments in welding procedure, as it applies to the oil industry in both the electric and oxy-acetylene processes. Demonstrations of development in pipe line welding will also be featured.

The Iowa Machine & Welding Company, First avenue north and Twenty-first street, Fort Dodge, Iowa, has been sold to Charles De Groote and Guy Stoner, who will continue to operate. A general line of machine work and welding is to be done, the firm making a specialty of heavy machine work as well as plant welding anywhere being equipped with portable welding machinery.

The Waltz Repair Shop has been opened at the Pedelty plant, 501 Second street northeast, Mason City, Iowa. The company is equipped with a complete machine shop and will take care of boiler and all welding work in addition to general machine and motor repair work.

The Lincoln Electric Company of Cleveland, Ohio, announce the change of their New York office from 136 Liberty street to 330 West 42nd street.

The new offices include a showroom of equipment and facilities for the demonstration of motors, welders, new electrodes and innovations in welding technique. Mr. G. N. Bull continues as district manager in New York.

Branch offices have also been established in Scranton and Allentown, Pennsylvania, D. Levenson being in charge of the first and F. Shackleton covering the latter territory. Both men were formerly welding technicians with the Philadelphia office of The Lincoln Electric Company.

Dyerweld Corporation, which was formerly known as Dyer Welding Machine Corp., Independence, Mo., has leased a new plant at Randolph, Mo. The new quarters include 25,000 feet of floor space which will be used for the manufacture of welding equipment. R. H. Dyer is president.

The Institution of Welding Engineers, 30 Red Lion Square, London, held its November meeting in The Chamber of Commerce, 95 New street, Birmingham, on Friday the 13th. E. W. Thompson and A. Jevons read a paper entitled, "Some Details of the Progress Reached in Forge and Other Welding in Boiler Works Practice." The paper was illustrated by lantern slides and a lively discussion followed.

The Indianapolis Chapter, A.S.S.T., at its meeting held in the Hotel Severin, Oct. 5, has as speaker, J. C. Lincoln of the Lincoln Electric Co., whose subject was "Some Recent Developments in Electric Welding." Among other points brought out, Mr. Lincoln indicated that welded steel construction could cut the cost about one-half to one-third in replacing cast iron. He also explained the harmful effects of the atmosphere on welds and described the operation of the electronic tornado.

The annual meeting of the Canadian Section of the Compressed Gas Manufacturers Association will be held at the Mt. Stephen Club, 1440 Drummond street, Montreal, on Tuesday, Dec. 15. The session will open with a luncheon at 12:30. Election of officers and other business will follow.

Mr. W. A. F. Millinger, division vice-president Pacific Coast, American Welding Society, left China Nov. 2nd for Singapore and a short tour of the Malay States and Java, thence to Melbourne, Australia, returning to Los Angeles, Calif., early in January. Mr. Millinger has been in the Orient since May and is interested in the development of electric arc welding on both sides of the Pacific coast.

Edward C. Smith, who has had many years of experience in the compressed gas industry as chief engineer, general superintendent and vice-president of the Harrisburg Pipe & Pipe Bending Company, is now engaged in consulting service on cylinder testing and cylinder problems. Mr. Smith's headquarters will be at 2623 North Second street, Harrisburg, Pa.

Thorvald Brown has leased properties at Humboldt, Iowa, and will operate a garage and welding shop. General repairing will be handled.

The New York Welding Supply Co., 83 Grand street, New York city, is now handling the WECO line of welding equipment, using the flame method for welding non-ferrous metals without porosity and using metallic arc for welds of high tensile strength. Both types of work are accomplished with a single machine. The company has also been appointed distributor in New York city for the Hollup line of welding electrodes.

The California Institute of Technology, in Pasadena, is erecting two all-welded steel domes for the installation of two large solar telescopes in the Astro-Physics Laboratories of the institution. One of the domes is 27 feet across, while the other is 17 feet. The Consolidated Steel Corp., of Los Angeles, has the contract for the welding. Both acetylene and electric processes are being employed.

WISSCO
WELDING WIRE

ALWAYS UNIFORM

WHEN a welder finds the Wire that *does his job,* he wants to know that every time he re-orders that particular number and brand that he gets the same smooth flowing wire that is exactly right. This is always true of Wissco Wire. Controlled manufacture from ore to Welding Wire enables us to produce a high quality wire that is constantly Uniform.

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Wickwire Spencer Steel Company, 41 East 42nd Street, New York City
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NOVIWELD GLASS

Blocks these hazards!

Every welder needs COMPLETE EYE PROTECTION, from

1. ***Dangerous Light*** **(*excess ultra-violet rays.*)**
2. ***Burning Rays*** **(*excess infra-red rays.*)**
3. ***Glare*** **(*excess visible light.*)**

With Noviweld Glass before your eyes you secure Safety and Efficiency. Look at these figures:

1. ***Noviweld Glass blocks out 100% of Ultra-Violet Rays.***
2. ***Noviweld Glass blocks out 99.5% to 99.99% of the Infra-Red Rays.***
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Noviweld Glass is recommended as standard equipment for welders, as it provides the most complete protection available for acetylene, gas or electric welding.

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Mechanical cutting and the development of fabrication which it has brought about represent the most radical improvement in machine construction in recent years. As old as it is to some, it is still comparatively new to many industries. Time has already proven its dependability, pointed out its economies and defined to a certain extent its present limitations.

F. T. Tarble and C. C. Vogle, Jr., of the Lynwood Welding Works, Lynwood, Calif., have acquired the interest in the concern of "Red" Smith, and will operate the shop under the joint ownership of the two partners. The shop opened for business in September.

Walter F. Vogel, of the San Antonio Machine & Supply Company, San Antonio, Texas, recently made a trip for his company into the Oklahoma oil field territory. This company features oil field welding in addition to general supply service.

H. R. Nevius, until recently a part owner in the Escondido (Calif.) Welding Works, has opened a new welding shop at 531 W. Main Street in El Monte, Calif. Mr. Nevius will handle all kinds of general welding, specializing on car starter teeth work.

G. R. Martin, of El Monte, California, recently purchased the welding and blacksmith shop known as the Boles & Miller shop located at 120 S. Granada Avenue in that city. Mr. Martin was formerly associated with the Universal Engineering Co., of Los Angeles.

The Barnett Welding & Sheet Metal Works, at 8417 Atlantic Ave., Bell, Calif., recently opened for business under the management of E. Barnett. Mr. Barnett, who was formerly associated with the Florence Avenue Sheet Metal Works, will feature job welding, tank, and general sheet metal work.

Alfred C. Fickes, well known in steel plate fabricating lines, and for the past eight years general sales manager of the Lancaster Iron Work, Lancaster, Pa., has become associated with the Biggs Boiler & Welding Works, of Akron, Ohio, as sales manager.

Mr. Fickes was identified with the steel industry for many years as a mechanical and structural engineer with the Philadelphia & Reading Coal & Iron Co., the Lehigh Coal & Navigation Co., Southern Pipe Line Co., Bethlehem Steel Co., and the McClintic-Marshall Construction Co., before entering the service of the Lancaster Iron Works in 1915 as chief engineer.

Superior Tool Co. has been incorporated at San Angelo, Texas, by R. E. Eppenauer to sell and repair oil field drilling tools. A complete welding shop will be maintained.

Industrial Iron Works has been organized at Enid, Okla., by C. E. Shriver, president, to engage in general and ornamental iron work including welding.

The Harris Calorific Company of Cleveland, Ohio, reports that its general manager, Lorn Campbell, Jr., has returned to Cleveland after a three months' business trip in Europe. Practically every country in Europe was visited, including Russia, and many new distributors were appointed.

The Welding Engineering Company of Bartlesville, Oklahoma, announces that the name of the company has been changed to H. C. Price, Inc. It is now incorporated under the laws of the State of Delaware. There is no change in the ownership and management, and the general offices of the company will still remain at Bartlesville, Oklahoma.

The Standard Specification of the Welder *and* Cutter

The name "Commercial" has been associated with dissolved acetylene since the beginning of oxy-acetylene welding.

"Commercial" is known for its RELIABILITY, UNIFORMITY, PURITY, and its ORGANIZATION for service to the industry.

Whatever your gas requirements, you should know about our sales plan. Ask our nearest office to tell you about it.

Supplied in the following size cylinders:

10x30 in. size—125 cu. ft. cap.
12x36 in. size—225 cu. ft. cap.
12x44 in. size—275 cu. ft. cap.

Commercial Acetylene Supply Co., Inc.

General office: 40 Rector St.
NEW YORK CITY

Branches:
600 W. Jackson Blvd., Chicago, Ill.
683 Atlantic Ave., Boston, Mass.
680 Hamilton Ave., S. E. Atlanta, Ga.

We also sell
OXYGEN
and a complete line of
APPARATUS
and
SUPPLIES

TRADE COMMERCIAL MARK ACETYLENE

CROWN BOILER FIX is a metallic powder with an aluminum base and is used by thousands of master plumbers and welding shops for repairing steam and hot-water boilers. Does not discolor the water.

The unusual and superior feature is that after being poured into boiler and repair is completed the compound never becomes harder than tar, thereby overcoming the most severe trouble encountered in boiler repair, that of expansion and contraction, as Crown Boiler Fix, acting like tar, will expand and contract under all adverse conditions. After electric welding a boiler, a can of Crown Boiler Fix will make the weld absolutely water-tight and will permanently repair all cracks that are impossible for the welder to reach.

Price, $8 per can, less 50% and 10%.
One can free with every six.

CROWN RADIATOR FIX is a metallic powder which repairs cracked water jackets, motorheads, leaky radiators, etc.

CROWN RADIATOR FIX MAKES ELECTRIC WELDS ON CAST IRON PERMANENTLY WATER-TIGHT.

Immediately after being poured in radiator, the compound circulates through the entire water system and starts to work.

As the water leaks through the cracks and porous parts, it carries with it the Crown Radiator Fix, which, instantly upon coming into contact with the air, congeals and forms a permanent metallic repair.

Price, $12 per doz., less 50%.
Prices on larger quantities on application.

CROWN ALL-METAL FILLER is a mineral composition that repairs cracked water jackets, motorheads, porous castings, etc. Heat part to be repaired to 300° heat and rub on filler which penetrates the cracks and pin holes and hardens almost immediately.

SPECIAL FOR ELECTRIC WELDERS

Crown All-Metal Filler is the only compound that will make an electric weld on cast iron absolutely watertight. It penetrates through the smallest pin-hole where it is possible for water to leak out, and the filler will rust, which is necessary for a permanent repair.

DOUBLE CROWN PROCESS

On extreme porous welds, apply All-Metal Filler on outside and Crown Radiator Fix on the inside. In the event that a hair crack is overlooked or develops after making the weld, this double seal process will positively make the job water-tight.

Standard size pound box, $4.50.

Manufacturers and Sole Distributors
CROWN ALUMINUM SOLDER CO., Inc., 881 E. 134th St., NEW YORK

(Continued from page 49)

do is to stop selling and be on your way. Better to leave while the prospect is still interested than to antagonize him by outstaying your welcome.

Closing the Deal. "Is he a closer?" This question is uppermost in the minds of executives when interviewing prospective salesmen, because they realize from the school of bitter experience the necessity of bringing buyers to decisions in favor of their goods.

The "woods are full" of clever and interesting talkers who can paint rosy pictures of a product or service but who are flat failures in getting buyers to "sign up." The prospect will bring up all sorts of objections—some sound and some foolish—will make all sorts of excuses to delay placing business. It will be your job to meet those objections fairly and without rancor and, after having done so, reemphasize the advantages of your services—in terms of the individual buyer's requirements—and then press for action. Show him savings, show him profits, show him that his product will be improved through the welding you do. Paint the picture so vividly and appealingly from his viewpoint that his own good business judgment will show the wisdom of placing a job with you. Remember, "Vot ve vant iss orders."

Selling Is Discouraging. Men who have never done personal selling usually underestimate the significance of one point—namely, it is most discouraging work, especially in the first few weeks or months. A high percentage of your original calls will be made on strangers. You will have to break down the barriers of indifference, coldness and prejudice. Many prospects will have to be completely educated first to the value of welding to them and second to the value of job welding service. Many superintendents and foremen are naturally "hard-boiled." Purchasing agents, as a group, are professional "objectors," trained to beat down your price.

After the inexperienced "knight of the brief case" has "done battle against this solid phalanx of gloom" for a few weeks without getting a single order, discouragement is inevitable. Here many job welders quit the creative side of their business and sink back into a "take what comes in" routine. It is here that the real "salesman-welder" will tighten up his belt and dig in all the harder. He will think over the work he has done and try to discover his mistakes. He will pick out the most likely prospects and call a second time. By sheer determination, intelligent planning and tactful persistence he will find ways and means of getting orders.

"Delivering the Goods"

Real success in building a job welding business consists in making every order pave the way to another. In other words, after you have sold the customer on the idea of giving you a welding job you must "come through" and live up to your promise so that the customer will be pleased with your work and glad to pay your price. If the customer is satisfied he will, more than likely, give you first consideration on his future work and he may speak a good word for you to other prospects.

On the other hand, if you disappoint the customer not only will he place his business elsewhere in the future but he may even "knock" you when talking to friends. When you stop to consider how much time and effort it costs you to develop a new customer you readily appreciate how essential it is to keep him after you get him. The whole program of selling successfully is well summed up in the statement, "the way to secure progressively profitable patronage is to render permanently satisfactory service."

Classified Ads

Help Wanted—75c per line, minimum 4 lines.
Jobs Wanted—4 lines free.
Other Ads—$1.00 per line, minimum 4 lines.
Count 8 words to line. Add 6 words for keyed address.

POSITIONS WANTED

Combination Welder—Young man well experienced in all phases of welding is willing to accept any reasonable offer of employment. Well recommended. Will go anywhere. Clarence L. Maxwell, Lock Box 83, Darlington, Ind.

ACETYLENE INSTRUMENT MAKER:
Will design and perfect special submarine or natural gas cutting torches—or any other special equipment for oxy-acetylene welding or cutting.
The Torch Shop, 1637 E. Vernon St., Los Angeles, Calif.

SALES ENGINEER WANTED

We want a Sales Engineer to take complete charge of welding wire sales in the United States and Canada. We will consider only applicants of proven ability in the sale and technique of welding wire. Applications are to be made by letter only, giving complete experience, qualifications and references. (Communications confidential.)

Igoe Brothers
240 Poinier Street
Newark, New Jersey

ATTENTION ELECTRIC WELDERS

Make Welds on Cast Iron Motor Blocks, Motor Heads, etc., Permanently Leakproof by Using BLACK & WHITE STOP LEAK.

After weld is completed, BLACK & WHITE, which is a metallic powder, is simply poured into radiator and positively seals all porous parts or cracks within a few minutes.

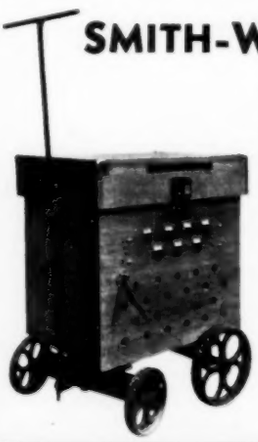
List price 75 cents per can.

Deal No. 1—6 cans FREE with 18-can order, less 40% (f.o.b. New York)
Deal No. 2—1 doz. FREE with 3-doz. order, less 40 and 5% (f.o.b. New York)
Deal No. 3—2 doz. FREE with 6-doz. order, less 40 and 10% (f.o.b. New York)
Deal No. 4—4 doz. FREE with 12-doz. order, less 40 and 20% (f.o.b. destination)

All orders shipped same day received.

BLACK & WHITE CHEM. CO. 128 Walnut Ave. NEW YORK CITY

SMITH-WATERS WELDER



Competitive tests prove that the Smith-Waters Welder can save as much as 50% in welding operating costs. The stable arc assures constant deposition of weld metal. No moving parts. This machine is unconditionally guaranteed for two years.

Write for descriptive literature

David H. Smith & Sons, Inc.
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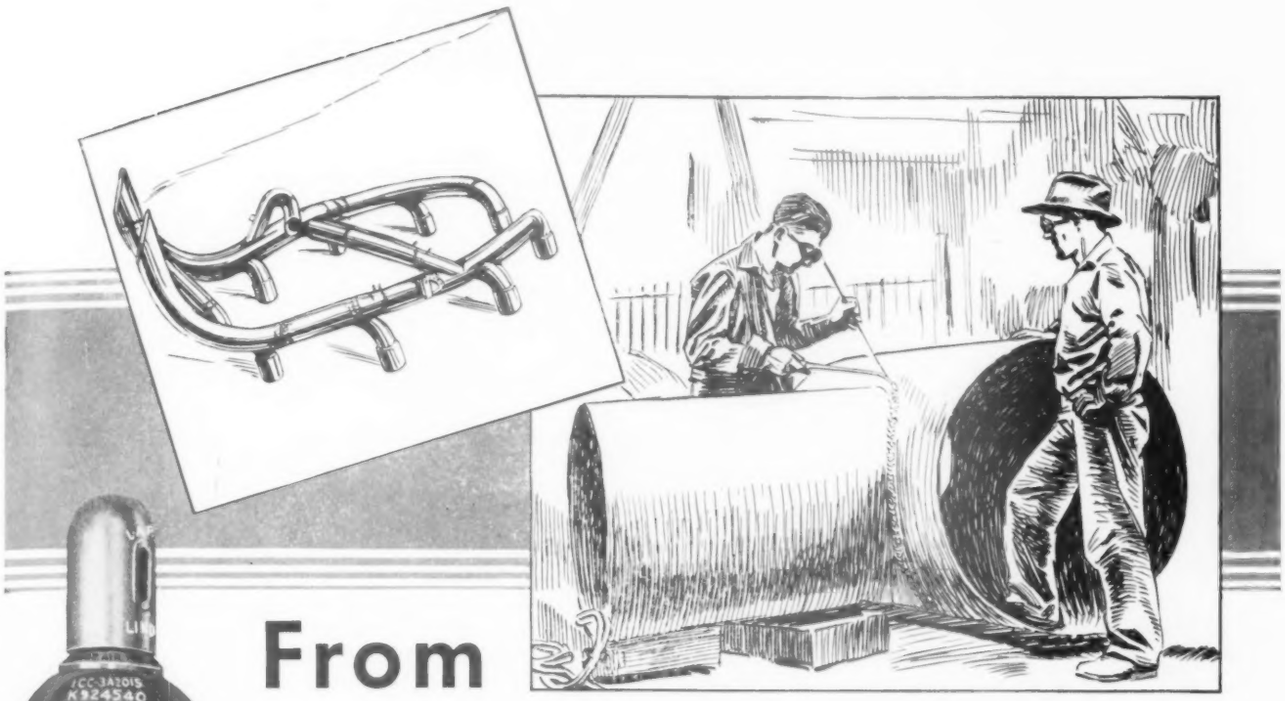
Valuable Territories Now Open to Responsible Dealers



From plan to production

LINDE PROCESS SERVICE CARRIES THROUGH

YOU are privileged to call upon Linde Process Service for assistance and advice in any phase of your operations wherein you use Linde Oxygen for welding and cutting.

This service brings to you the wealth of welding experience Linde has gained over many years of pioneering the oxy-acetylene process. It supplements the work of your own engineers in organizing your welding and cutting operations for maximum speed, economy and dependability. It injects the best practices of the day toward the solution of your specific problems.

Here are some of the numberless things Linde Process Service has done:

It assisted a contractor in relocating piping under a narrow street during subway excavation. Linde Process Service helped to plan a flexible system, permitting changes as the subway progressed, and helped in securing strong welds which withstood severe abuse.

It helped a manufacturer make pipe for chemical use from sheet aluminum. It supervised the welding routine, trained welders and suggested short cuts which speeded up production.

It assisted an automobile body manufacturer in maintaining schedules by integrating cutting and oxwelding with other production processes.

Whether you are adopting the oxy-acetylene process as a new user or are seeking additional advantages from its further application, Linde Process Service can help you. This service is "service" in the fullest meaning of the word. Write or call the nearest Linde District Office.

THE LINDE AIR PRODUCTS COMPANY

Unit of Union Carbide and Carbon Corporation

126 Producing Plants — UCC — 627 Warehouse Stocks

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District Offices

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LINDE OXYGEN · PREST-O-LITE ACETYLENE · OXWELD APPARATUS AND SUPPLIES · UNION CARBIDE

Why it always "works" the same

Users of Roebling Welding Wire invariably say that one of its outstanding characteristics is its absolute uniformity—the fact that it always "feels", always "works" the same.

There is, of course, a logical reason for this Roebling advantage. It lies in Roebling's special manufacturing methods, which insure not merely a wire of the desired chemical analysis but one *always* free of non-metallic impurities.

The steel for this wire is not made on a tonnage basis. It is *custom-made* in small open-hearth furnaces of special melting stock—permitting very accurate control of the melt. This process takes longer—and demands painstaking care—but it results in the finest welding steel producible.

We invite you to test Roebling Welding Wire and to judge its quality for yourself. Samples will gladly be furnished by our nearest office. Made in gas and electric types.

JOHN A. ROEBLING'S SONS COMPANY, TRENTON, N. J.

Wire · Wire Rope · Copper and Insulated Wires and Cables · Flat Wire · Wire Cloth and Wire Netting

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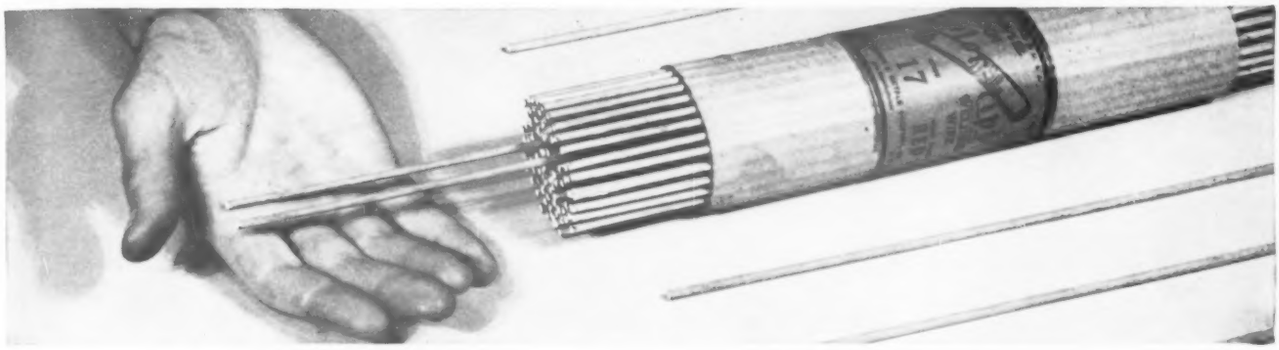
ROEBLING WELDING WIRE

Only with this rod-for-rod

UNIFORMITY

can you obtain perfect Uniformity in welds



In every grade of Wilson Wire every rod is exactly like every other rod of that grade — wherever it is bought and whenever it is bought

Just as a chain is no stronger than its weakest link, so a weld is no stronger than its weakest part. And a weld can have only as much *Uniformity* as there is in the rods which compose it. Wilson Welds are known for their perfect *Uniformity* in strength and structure, because there is rod-for-rod *Uniformity* in every grade of Wilson Wire. Use Wilson Wire and you, too, can produce uniform welds. Ask your nearest Wilson Distributor, or write to Wilson Welder & Metals Co. Inc., North Bergen, N. J., for samples of the correct grade for the metal you are welding.

WILSON

ARC-WELDING MACHINES AND WIRE

Copr. 1931, Wilson Welder & Metals Co. Inc.

GENERATORS (Acetylene)
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Harris Calorific Co.
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GOGGLES
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Ideal Face Shield Co.
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See "Hard Facing Materials"

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See "Mechanically Operated Cutting Torches"

MACHINES, SHAPE CUTTING, Oxy-Acetylene
See "Mechanically Operated Cutting Torches"

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VALVES
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WELDING & CUTTING APPARATUS, Oxy-Acetylene
See "Torches, Welding and Cutting"

WELDING COMPOUND (for Shape Welding)
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WELDING RODS AND WIRE
See "Electrodes" and "Acetylene Welding Wire"

X-RAY EQUIPMENT
General Electric X-Ray Corp.

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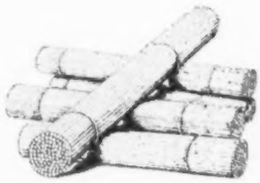

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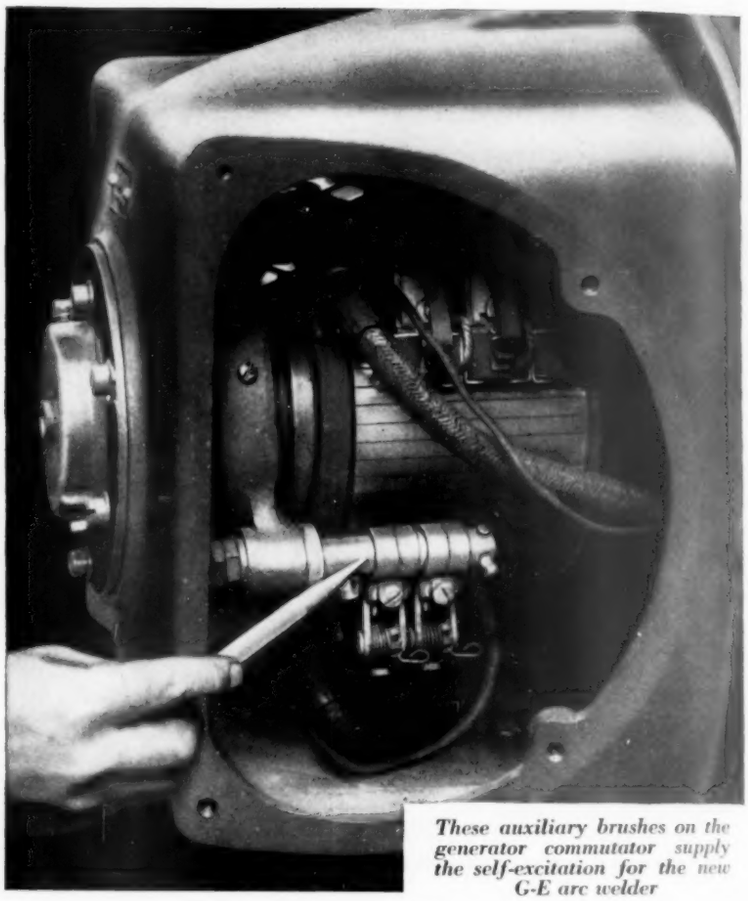

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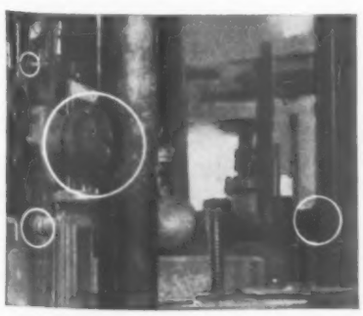
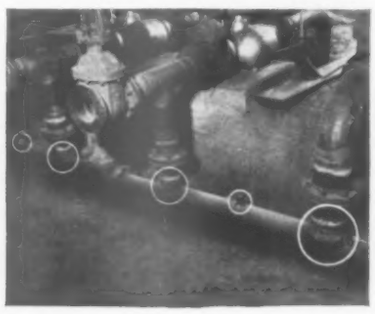


Below: Bonney Weldolets installed in a natural gas regulating station. Operating pressure 600 pounds per square inch.



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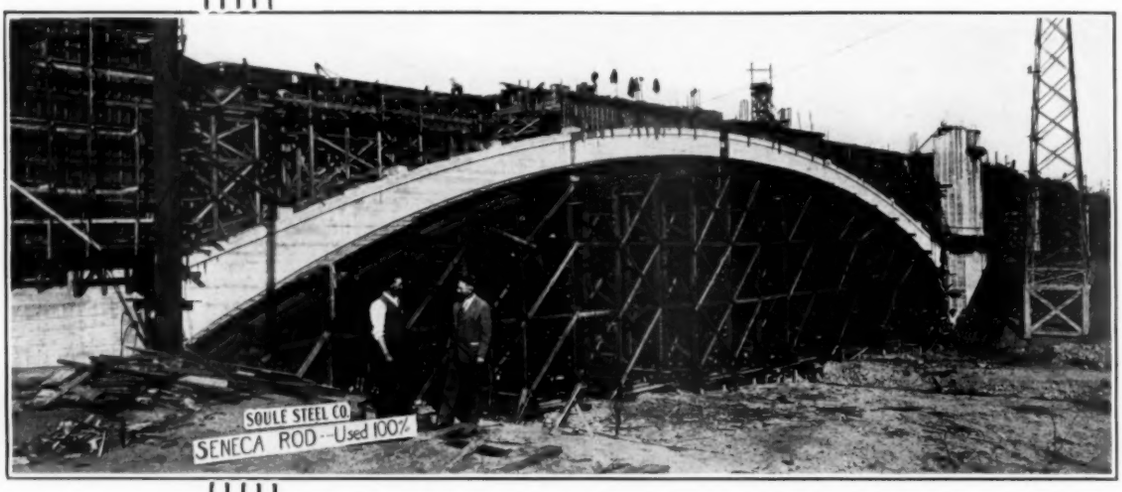

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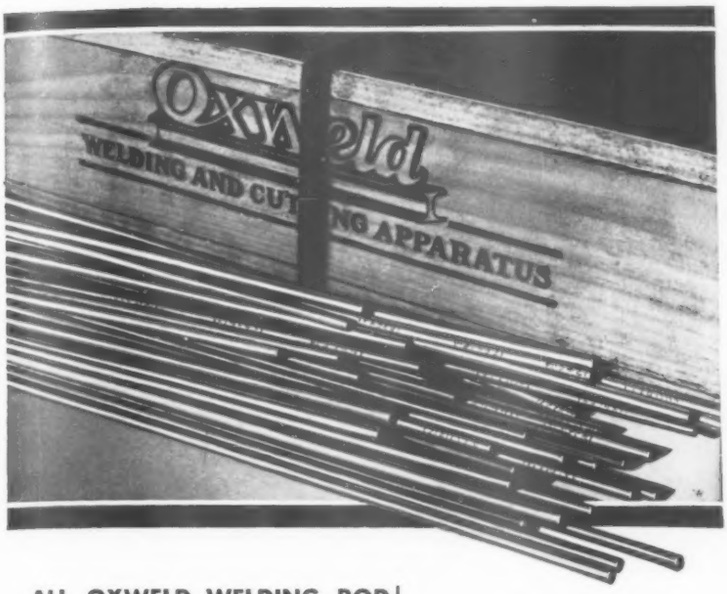

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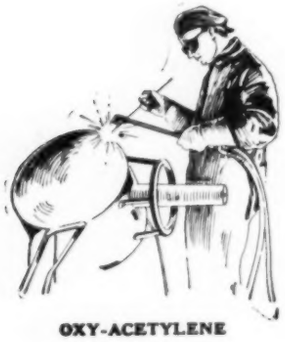

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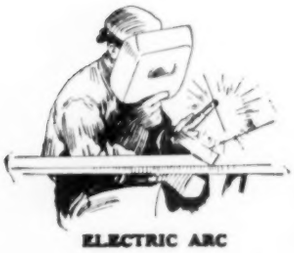

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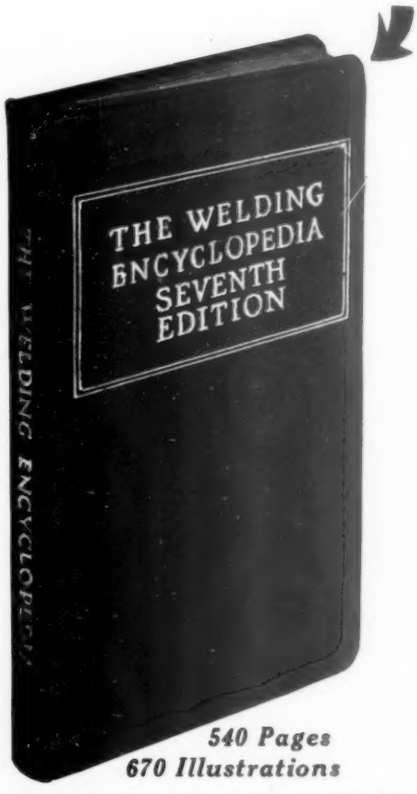

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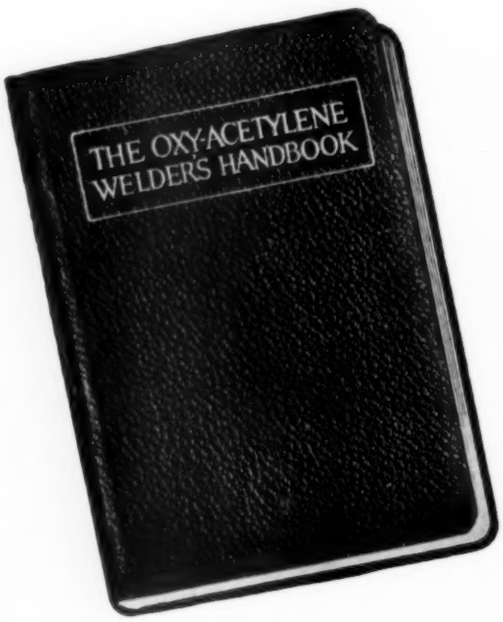

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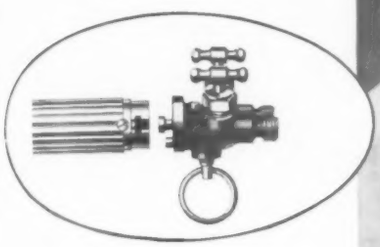

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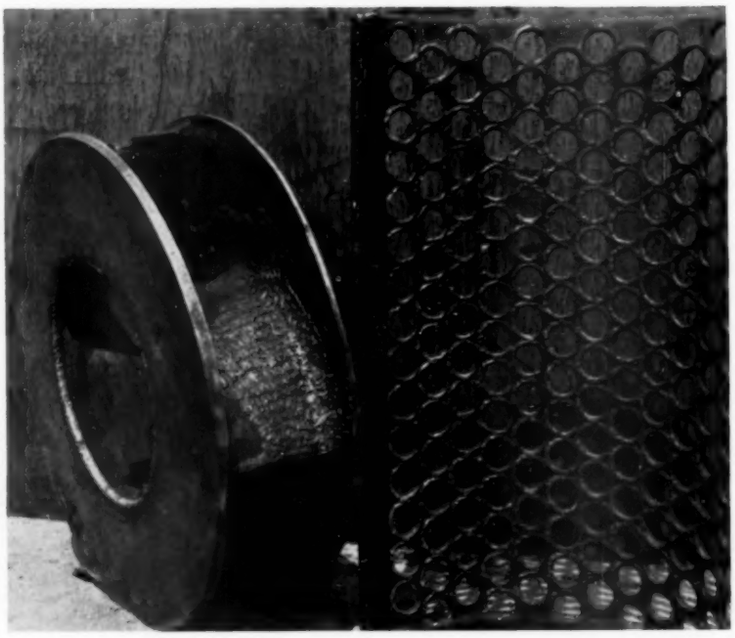

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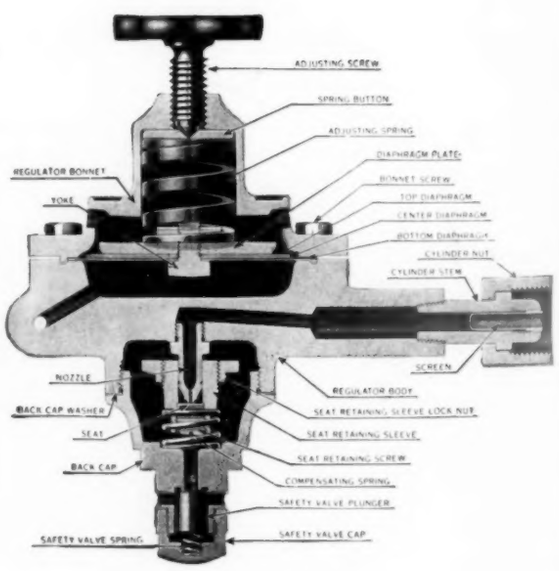

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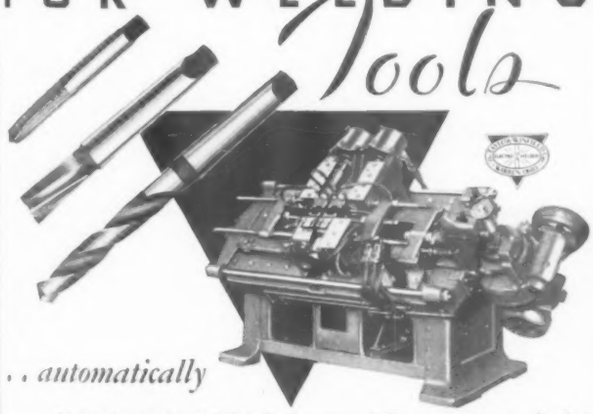

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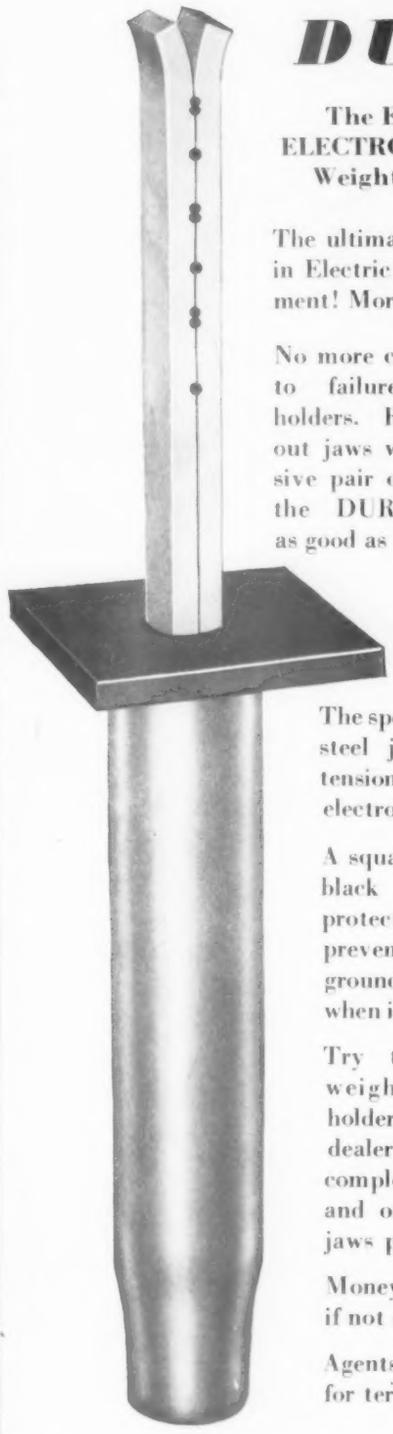

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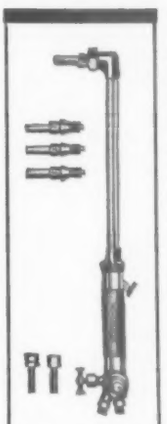

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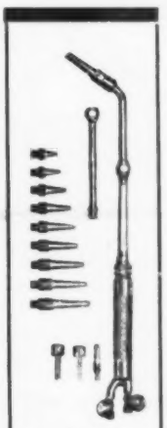

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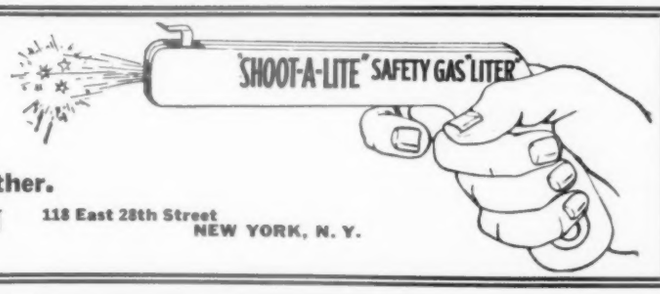

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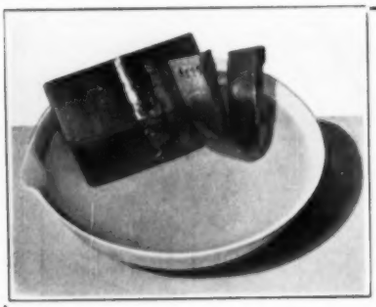

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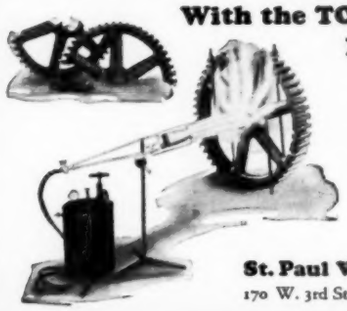

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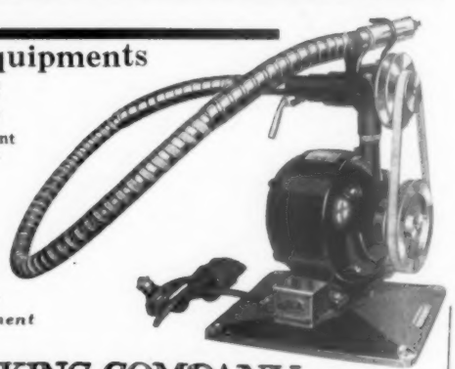

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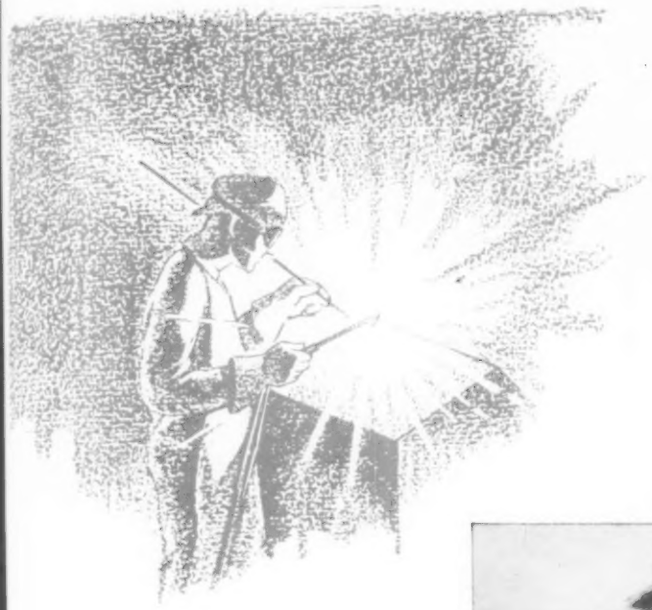

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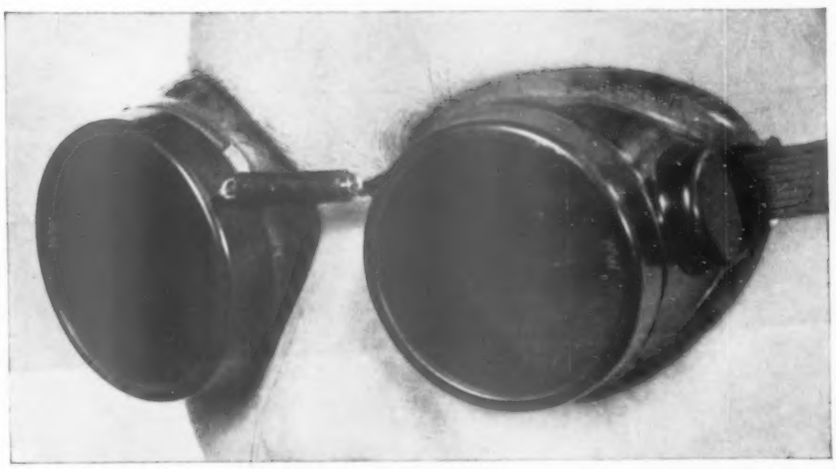
A great hazard in welding comes from dangerous light rays that the eye cannot see.



The Improved **BULL DOG** Welding Goggle

Those blinding, glaring lights that you see at welding operations in shops and on rails of street railways aren't just an eye hazard because of their brightness—but because of the dangerous rays that the eye cannot see. Many people think that a piece of dark glass that cuts down this glare to a normal light—must of necessity eliminate the hazard—but that is a great mistake. Infra-red rays (heat rays) comprise a large portion of light, altho they are invisible to the naked eye. These rays will penetrate glass in large amounts — regardless of the density of the glass—unless the proper chemical has been put in the glass to absorb it. The infra-red (heat rays) if not kept from the eyes by a glass that absorbs them has a drying effect often causing "sandy eyes" as well as other serious results. Permanent impairment of sight may result from continued exposure. So when you select eye protection for your welders—determine definitely the dangerous light absorption of the glass—but never be guided solely by the physical appearance of it. Willson-Weld is made for those who want actual eye protection, and we will gladly give you authentic figures which show the higher efficiency of Willson-Weld on any welding job.

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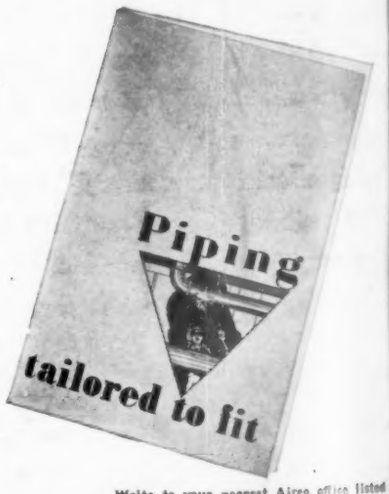

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